

# S9551-BP-MMC-010

---

ORIGINAL

TECHNICAL MANUAL

OPERATION AND MAINTENANCE MANUAL

ORGANIZATIONAL LEVEL

SELF-CONTAINED BREATHING APPARATUS  
HIGH PRESSURE BREATHING AIR CHARGING SYSTEM  
(SCBA HP BACS)  
FOR  
LPD-4 CLASS SHIPS

0910-LP-102-7750

N61331-01-D-0018



DISTRIBUTION STATEMENT A: APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.

PUBLISHED BY DIRECTION OF COMMANDER, NAVAL SEA SYSTEMS COMMAND

---



0910LP1027750

**THIS PAGE INTENTIONALLY LEFT BLANK**

TECHNICAL MANUAL  
OPERATION AND MAINTENANCE MANUAL  
ORGANIZATIONAL LEVEL  
SELF-CONTAINED BREATHING APPARATUS  
HIGH PRESSURE BREATHING AIR CHARGING SYSTEM  
(SCBA HP BACS)  
FOR  
LPD-4 CLASS SHIPS

0910-LP-102-7750

N61331-01-D-0018



DISTRIBUTION STATEMENT A: APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.

PUBLISHED BY DIRECTION OF COMMANDER, NAVAL SEA SYSTEMS COMMAND

---

30 September 2005

**LIST OF EFFECTIVE PAGES****INSERT LATEST CHANGED PAGES. DESTROY SUPERSEDED PAGES.**

The portion of the text affected by the changes is indicated by a vertical line in the outer margins of the page. Changes to illustrations are indicated by shaded or screened areas, or by miniature pointing hands.

Dates of issue for original and changed pages are:

Original . . . . .0 . . . . .30 September 2005

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 287 CONSISTING OF THE FOLLOWING:

Page No.	*Change No.	Page No.	*Change No.	Page No.	*Change No.
Title Page .....	0	2-1 thru 2-14 .....	0	5-12 Blank (Foldout).....	0
A .....	0	2-15 (Foldout) .....	0	6-1 thru 6-116.....	0
B Blank .....	0	2-16 Blank (Foldout) .....	0	7-1 thru 7-66.....	0
Record of Changes.....	0	3-1 thru 3-26 .....	0	7-67 (Foldout).....	0
Blank.....	0	4-1 thru 4-7 .....	0	7-68 Blank (Foldout).....	0
i thru xi .....	0	4-8 Blank.....	0	7-69 thru 7-72.....	0
xii Blank .....	0	5-1 thru 5-9 .....	0	8-1 thru 8-7.....	0
xiii thru xviii .....	0	5-10 Blank.....	0	8-8 Blank .....	0
1-0 thru 1-6 .....	0	5-11 (Foldout) .....	0		

\* Zero in this column indicates an original page



**THIS PAGE INTENTIONALLY LEFT BLANK**

RECORD OF CHANGES

CHANGE NO.	DATE	TITLE OR BRIEF DESCRIPTION	ENTERED BY

**THIS PAGE INTENTIONALLY LEFT BLANK**

## TABLE OF CONTENTS

<b><u>Chapter/Paragraph</u></b>	<b><u>Page</u></b>
List of Illustrations .....	viii
List of Tables .....	xi
Foreword .....	xiii
List of Acronyms and Abbreviations .....	xiv
Safety Summary .....	xv
 <b>1 GENERAL INFORMATION AND SAFETY PRECAUTIONS</b>	
1.1 Safety Precautions .....	1-1
1.2 Introduction .....	1-1
1.3 Equipment Description .....	1-1
1.3.1 Major Assemblies .....	1-1
1.3.1.1 High Pressure Breathing Air Compressor (HPBAC) .....	1-3
1.3.1.2 SCBA Filter Panel Assembly .....	1-3
1.3.1.3 SCBA Charging Panel Assembly .....	1-3
1.3.1.4 Ship's Air Storage Flasks .....	1-3
1.3.2 Equipment Sizes and Weights .....	1-4
1.4 Reference Data .....	1-4
 <b>2 OPERATION</b>	
2.1 Introduction .....	2-1
2.2 Controls and Indicators .....	2-1
2.2.1 Operating Controls and Indicators .....	2-1
2.2.2 Maintenance Indicators .....	2-1
2.3 Operating Procedures .....	2-7
2.3.1 Compressor Restart After Trip Condition .....	2-11
2.3.2 Long-Term Shutdown .....	2-11
2.3.2.1 Preparation .....	2-12
2.3.2.2 Preserving the Compressor .....	2-13
2.3.2.3 Reactivating HPBAC After Long-Term Shutdown .....	2-13
2.4 Operating Log .....	2-14

**TABLE OF CONTENTS – Continued.**

<b><u>Chapter/Paragraph</u></b>	<b><u>Page</u></b>
<b>3 FUNCTIONAL DESCRIPTION</b>	
3.1 Introduction.....	3-1
3.2 Major Assemblies and Support Equipment.....	3-1
3.2.1 High Pressure Breathing Air Compressor (HPBAC) .....	3-3
3.2.1.1 Frame Assembly .....	3-4
3.2.1.2 Instrument and Control Panel.....	3-4
3.2.1.2.1 Oil Pressure Gauge .....	3-4
3.2.1.2.2 Air Pressure Gauges .....	3-4
3.2.1.2.3 Securus® Purification Monitor .....	3-4
3.2.1.2.4 Start Pushbutton Switch .....	3-4
3.2.1.2.5 Power ON/OFF Selector Switch .....	3-4
3.2.1.2.6 Inlet Filter Maintenance Indicator.....	3-6
3.2.1.2.7 High Temperature Indicator Light .....	3-6
3.2.1.2.8 Low Oil Pressure Indicator Light.....	3-6
3.2.1.2.9 Hourmeter.....	3-6
3.2.1.2.10 Master ON/OFF Selector Switch.....	3-6
3.2.1.2.11 Condensate Pre-Separator Assembly .....	3-6
3.2.1.2.12 Silencer/Separator .....	3-7
3.2.1.3 Electrical Panel.....	3-7
3.2.1.3.1 Oil Pressure Switch 40-Second Delay Relay .....	3-7
3.2.1.3.2 High Air Temperature Relay .....	3-7
3.2.1.3.3 Motor Overload Relay .....	3-7
3.2.1.3.4 Moisture Monitor Relay .....	3-7
3.2.1.3.5 Air Pressure Switch Relay .....	3-9
3.2.1.4 HPBAC Drive Motor/Cable Assembly.....	3-9
3.2.1.5 HPBAC Compressor Block Assembly .....	3-9
3.2.1.5.1 Oil Sight Glass .....	3-9
3.2.1.5.2 Oil Filler Cap .....	3-9
3.2.1.5.3 Air Intake Filter .....	3-11
3.2.1.5.4 Interstage Filters .....	3-11
3.2.1.5.5 ACD Valve Assembly.....	3-11
3.2.1.5.6 1st, 2nd, and 3rd Stage Pressure Relief Valves .....	3-13
3.2.1.5.7 Crankcase De-mister .....	3-13
3.2.1.5.8 Oil Pump Drive V-Belt Cover .....	3-13
3.2.1.5.9 Cooling Components .....	3-14
3.2.1.5.10 Lubrication Components .....	3-14

**TABLE OF CONTENTS – Continued.**

<b><u>Chapter/Paragraph</u></b>	<b><u>Page</u></b>
3.2.1.5.11 Compressor Valves and Valve Heads.....	3-16
3.2.1.6 HPBAC Air Purification System.....	3-16
3.2.1.6.1 Oil and Water Separator.....	3-16
3.2.1.6.2 4th Stage Pressure Relief Valve.....	3-16
3.2.1.6.3 Check Valves .....	3-16
3.2.1.6.4 Dryer Chambers .....	3-16
3.2.1.6.5 Purifier Chamber and Securus® Sensor .....	3-16
3.2.1.6.6 Securus® Purification Monitor .....	3-18
3.2.1.6.7 Bleed Valve .....	3-18
3.2.1.6.8 Pressure Maintaining Valve (PMV).....	3-18
3.2.1.6.9 HPBAC Condensate Reservoir Assembly .....	3-18
3.2.2 SCBA Filter Panel Assembly .....	3-20
3.2.3 SCBA Charging Panel Assembly .....	3-20
3.2.3.1 Back Pressure Regulator .....	3-20
3.2.3.2 Check Valve .....	3-20
3.2.3.3 Stop Valve.....	3-20
3.2.3.4 Pressure Reducing Regulator .....	3-20
3.2.3.5 Relief Valve .....	3-22
3.2.3.6 Gauge Isolation Valves .....	3-22
3.2.3.7 Gauges .....	3-22
3.2.4 Ship's Air Storage Flasks .....	3-22
3.2.4.1 Flask Relief Valve .....	3-22
3.2.4.2 Flask Drain Valves .....	3-22
3.2.4.3 Flask Isolation Valve .....	3-22
3.2.5 Support Equipment.....	3-22
3.2.5.1 Filtered Air Supply Hose Assembly (H-103).....	3-23
3.2.5.2 SCBA Quick-Charge Hose Assembly .....	3-23
3.3 System Flow Analysis .....	3-23
 <b>4 SCHEDULED MAINTENANCE</b>	
4.1 Introduction .....	4-1
4.2 Scope .....	4-1
4.3 Scheduled Maintenance Requirements .....	4-1
4.4 Personnel Requirements.....	4-1
4.5 General Maintenance Instructions.....	4-3
4.5.1 Disassembly and Replacement of Parts.....	4-3
4.5.2 Clean Working Environment.....	4-3

## TABLE OF CONTENTS – Continued.

<u>Chapter/Paragraph</u>	<u>Page</u>
4.5.3 Openings .....	4-3
4.5.4 Repair or Replacement .....	4-3
4.5.4.1 Repair of Threaded Parts .....	4-3
4.5.4.2 Replacement Parts .....	4-4
4.5.5 Antiseize Tape .....	4-4
4.5.6 Lubricants .....	4-4
4.5.7 O-rings .....	4-4
4.5.7.1 Removal .....	4-4
4.5.7.2 Installation .....	4-4
4.5.8 Torque Guidelines .....	4-5
4.5.8.1 Torque Values .....	4-5
4.5.8.2 Prevailing Torque .....	4-5
4.5.9 Cleaning .....	4-6
4.5.9.1 General Cleaning Practices .....	4-6
4.5.9.2 Component Cleaning .....	4-6
4.5.9.3 Drying and Dry Cleaning .....	4-6
4.5.10 Inspection .....	4-7
4.5.10.1 Leak Detection .....	4-7
4.5.10.2 Correcting Leaks .....	4-7
4.5.11 Checkout .....	4-7
4.6 Failure Analysis Reporting .....	4-7
4.6.1 Record Keeping .....	4-7
4.6.2 Reporting Failures .....	4-7
 <b>5 TROUBLESHOOTING</b>	
5.1 Introduction .....	5-1
5.2 Troubleshooting Chart .....	5-1
5.3 Schematic Diagrams .....	5-1
 <b>6 CORRECTIVE MAINTENANCE</b>	
6.1 Introduction .....	6-1
6.1.1 Purpose and Scope .....	6-1
6.1.2 Repair Tools, Materials, and Test Equipment .....	6-1
6.2 Repair .....	6-1
6.2.1 General Maintenance Instructions .....	6-1
6.2.2 Components to be Repaired .....	6-1
6.2.3 Tube Assemblies .....	6-1

**TABLE OF CONTENTS – Continued.**

<b><u>Chapter/Paragraph</u></b>	<b><u>Page</u></b>
6.2.4 Functional Test.....	6-1
6.2.5 System Depressurization and Pressurization.....	6-2
6.3 HPBAC Repair.....	6-4
6.3.1 Access Panels.....	6-11
6.3.1.1 Side Access Panels .....	6-11
6.3.1.2 Roof Panel .....	6-13
6.3.1.3 Rear Panel .....	6-15
6.3.1.4 Belt Guard Panel.....	6-16
6.3.1.5 Electrical Enclosure Access Panel.....	6-17
6.3.2 V-Belts.....	6-19
6.3.2.1 Drive V-Belts .....	6-19
6.3.2.2 Oil Pump Drive V-Belt .....	6-22
6.3.3 Electrical Panel.....	6-25
6.3.3.1 Overload Relay and Motor Starter.....	6-25
6.3.3.2 Transformer .....	6-30
6.3.3.3 Automatic Condensate Drain (ACD) Timer .....	6-32
6.3.3.4 Printed Circuit Board 1 (1PCB) .....	6-34
6.3.3.5 Printed Circuit Board 2 (2PCB) .....	6-36
6.3.3.6 Terminal Block .....	6-37
6.3.4 Instrument and Control Panel.....	6-38
6.3.4.1 HPBAC Gauges.....	6-40
6.3.4.1.1 Air Pressure Gauges .....	6-40
6.3.4.1.2 Oil Pressure Gauge.....	6-42
6.3.4.2 Start Pushbutton Switch .....	6-44
6.3.4.3 Power ON/OFF Selector Switch .....	6-46
6.3.4.4 Master ON/OFF Selector Switch .....	6-48
6.3.4.5 Inlet Filter Maintenance Indicator.....	6-50
6.3.4.6 Indicator Lights .....	6-52
6.3.4.7 Hourmeter .....	6-54
6.3.5 Automatic Condensate Drain (ACD).....	6-56
6.3.6 Silencer/Separator.....	6-59
6.3.6.1 Silencer .....	6-59
6.3.6.2 Separator .....	6-60
6.3.7 Air Purification System .....	6-62
6.3.7.1 Securus® Purification Monitor.....	6-64
6.3.7.2 Pressure Maintaining Valve (PMV) .....	6-66
6.3.7.3 Filters and Housings .....	6-71



## TABLE OF CONTENTS – Continued.

<u>Chapter/Paragraph</u>	<u>Page</u>
6.3.7.3.1 Coalescing Filter .....	6-71
6.3.7.3.2 Purifier/Dryer Assembly .....	6-74
6.3.8 Compressor Block Assembly .....	6-77
6.3.8.1 Compressor Block .....	6-77
6.3.8.2 Pressure Cut-Out Switches (1PS Air, 2PS Oil).....	6-81
6.3.8.2.1 Air Pressure Switch (1PS) Adjustment .....	6-82
6.3.8.2.2 Oil Pressure Switch (2PS) Adjustment .....	6-82
6.3.8.3 Oil Pressure Regulator .....	6-84
6.3.8.3.1 Oil Pressure Regulator Removal and Replacement .....	6-84
6.3.8.3.2 Oil Pressure Regulator Adjustment.....	6-86
6.3.8.3.3 Venting the Oil Pump.....	6-87
6.3.9 Drive Motor/Cable Assembly .....	6-88
6.4 SCBA Filter Panel and Charging Panel Repair.....	6-91
6.4.1 SCBA Filter (F-207) .....	6-93
6.4.2 Back Pressure Regulator (AHP-V101).....	6-96
6.4.3 One-Way Check Valve (AHP-V102) .....	6-99
6.4.4 Stop Valve (AHP-V103) .....	6-101
6.4.5 Pressure Reducing Regulator (AHP-V104).....	6-104
6.4.6 Relief Valve (AHP-V105) .....	6-108
6.4.7 Gauge Isolation Valves (AHP-V106 and AHP-V107).....	6-111
6.4.8 Gauges (AHP-G101 and AHP-G102) .....	6-114
 <b>7 ILLUSTRATED PARTS BREAKDOWN</b>	
7.1 Scope .....	7-1
 <b>8 INSTALLATION</b>	
8.1 Introduction.....	8-1
8.2 Installation Drawings .....	8-1
8.3 Clearances .....	8-1
8.4 Unpacking and Preservation .....	8-3
8.4.1 Unpacking.....	8-3
8.4.2 Preservation.....	8-3
8.4.3 Packing .....	8-3
8.5 Input Requirements .....	8-5
8.5.1 Electrical .....	8-5

**TABLE OF CONTENTS – Continued.**

<b><u>Chapter/Paragraph</u></b>	<b><u>Page</u></b>
8.5.2 Ecological .....	8-5
8.6 Installation Checkout .....	8-5
8.6.1 Physical Check .....	8-5
8.6.2 Pre-Start Check .....	8-7
8.7 Qualified Operator .....	8-7

## LIST OF ILLUSTRATIONS

<b><u>Figure/Title</u></b>	<b><u>Page</u></b>
1-1 SCBA HP BACS System Illustration.....	1-2
2-1 HPBAC Instrument and Control Panel Controls and Indicators.....	2-2
2-2 Securus® Purification Monitor Indicators .....	2-3
2-3 SCBA Charging Panel Controls and Indicators .....	2-4
2-4 HPBAC and Purification System Controls and Indicators.....	2-5
2-5 Filtered Air Supply Hose Assembly (H-103) Controls.....	2-6
2-6 Sample Operating Log .....	2-15
3-1 SCBA HP BACS Major Assemblies.....	3-2
3-2 HPBAC Major Subassemblies.....	3-3
3-3 Instrument and Control Panel.....	3-5
3-4 Electrical Panel .....	3-8
3-5 Compressor Block Components.....	3-10
3-6 Lubrication Oil Circuit .....	3-15
3-7 Oil Separator .....	3-15
3-8 Air Purification System .....	3-17
3-9 Securus® Purification Monitor .....	3-19
3-10 SCBA Filter Panel and Charging Panel Components .....	3-21
3-11 SCBA Filter Panel and Charging Panel Functional Flow Diagram .....	3-25
3-12 SCBA HP BACS Functional Diagram.....	3-26
5-1 Pneumatic Schematic Diagram .....	5-8
5-2 Ladder Diagram .....	5-9
5-3 Electrical Wiring Diagram .....	5-11
6-1 System Depressurization and Pressurization.....	6-3
6-2 Functional Test.....	6-9
6-3 Side Access Panels.....	6-12
6-4 Roof Panel .....	6-13
6-5 Rear Panel .....	6-15
6-6 Belt Guard Panel .....	6-16
6-7 Electrical Enclosure Access Panel .....	6-17
6-8 Drive V-Belt.....	6-20
6-9 Oil Pump Drive V-Belt .....	6-23
6-10 Electrical Panel .....	6-26
6-11 Overload Relay and Motor Starter.....	6-28

**LIST OF ILLUSTRATIONS – Continued.**

<b><u>Figure/Title</u></b>	<b><u>Page</u></b>
6-12 Transformer .....	6-31
6-13 Automatic Condensate Drain (ACD) Timer .....	6-33
6-14 Printed Circuit Board 1 (1PCB) .....	6-35
6-15 Printed Circuit Board 2 (2PCB) .....	6-37
6-16 Instrument and Control Panel .....	6-39
6-17 HPBAC Gauges .....	6-41
6-18 Start Pushbutton Switch.....	6-45
6-19 Power ON/OFF Selector Switch.....	6-47
6-20 Master ON/OFF Selector Switch.....	6-49
6-21 Inlet Filter Maintenance Indicator .....	6-50
6-22 Indicator Light .....	6-52
6-23 Hourmeter.....	6-55
6-24 Automatic Condensate Drain (ACD) .....	6-57
6-25 Silencer/Separator .....	6-60
6-26 Air Purification System.....	6-63
6-27 Securus® Purification Monitor .....	6-65
6-28 Pressure Maintaining Valve (PMV) .....	6-67
6-29 Pressure Maintaining Valve (PMV) Adjustment .....	6-70
6-30 Coalescing Filter .....	6-73
6-31 Purifier/Dryer Assembly .....	6-75
6-32 Accessing Compressor Block .....	6-79
6-33 Compressor Block Removal .....	6-80
6-34 Pressure Cut-Out Switches (1PS Air, 2PS Oil) .....	6-83
6-35 Oil Pressure Regulator.....	6-85
6-36 Oil Pressure Regulator Adjustment.....	6-86
6-37 Venting the Oil Pump .....	6-87
6-38 Drive Motor .....	6-89
6-39 SCBA Filter Panel and Charging Panel Components .....	6-91
6-40 SCBA Filter (F-207) .....	6-94
6-41 Back Pressure Regulator (AHP-V101).....	6-97
6-42 One-Way Check Valve (AHP-V102) .....	6-100
6-43 Stop Valve (AHP-V103) .....	6-102

**LIST OF ILLUSTRATIONS – Continued.**

<b><u>Figure/Title</u></b>	<b><u>Page</u></b>
6-44 Pressure Reducing Regulator (AHP-V104) .....	6-105
6-45 Regulator Adjustment.....	6-107
6-46 Relief Valve (AHP-V105).....	6-109
6-47 Gauge Isolation Valves (AHP-V106 and AHP-V107) .....	6-112
6-48 Gauges (AHP-G101 and AHP-G102).....	6-115
7-1 High Pressure Breathing Air Compressor (HPBAC).....	7-2
7-2 Compressor Block Assembly .....	7-18
7-3 HPBAC Instrument and Control Panel .....	7-47
7-4 Air Purification System .....	7-57
7-5 Drive Motor/Cable Assembly.....	7-65
7-6 SCBA Filter Panel and Charging Panel Assemblies .....	7-67
7-7 Filtered Air Supply Hose Assembly (H-103) .....	7-71
7-8 Scott® Charging Wand.....	7-72
8-1 Minimum Clearances.....	8-2
8-2 Footprint, Cable Mount Base Plate .....	8-4
8-3 Ship's Power Input and Center of Gravity .....	8-6

## LIST OF TABLES

1-1	SCBA HP BACS Reference Data .....	1-4
1-2	Equipment and Accessories .....	1-5
1-3	Related Documents .....	1-6
2-1	Operating Procedures.....	2-7
2-2	Trip Conditions.....	2-11
3-1	Automatic Condensate Drain (ACD) Valve Assembly Operating Cycles .....	3-13
3-2	Securus® Purification Monitor Warnings .....	3-19
3-3	Pressure Ranges .....	3-24
4-1	SCBA HP BACS/LPD-4 Scheduled Maintenance .....	4-2
4-2	Standard Torque Table .....	4-5
5-1	Troubleshooting Chart .....	5-2
6-1	Tools and Test Equipment.....	6-4
6-2	Consumable Materials .....	6-5
6-3	Maintenance Reference Chart .....	6-5
6-4	Functional Test .....	6-7
6-5	Continuity Check.....	6-29
7-1	High Pressure Breathing Air Compressor (HPBAC) Parts List .....	7-10
7-2	Compressor Block Assembly Parts List .....	7-35
7-3	HPBAC Instrument and Control Panel Parts List .....	7-52
7-4	Air Purification System Parts List.....	7-62
7-5	Drive Motor/Cable Assembly Parts List.....	7-66
7-6	SCBA Filter Panel and Charging Panel Assemblies Parts List .....	7-69
7-7	Filtered Air Supply Hose Assembly (H-103) Parts List.....	7-71
7-8	Scott® Charging Wand Parts List .....	7-72
8-1	Intake and Exhaust Opening vs. Room Volume .....	8-6

**THIS PAGE INTENTIONALLY LEFT BLANK**

## FOREWORD

This technical manual contains operation and maintenance instructions for use with the Self-Contained Breathing Apparatus High Pressure Breathing Air Charging System (SCBA HP BACS) for LPD-4 Class Ships. The High Pressure Breathing Air Compressor, which is a major sub-assembly of the SCBA HP BACS, is manufactured by MEGGITT Airdynamics, Inc. (formerly Howden Airdynamics, Inc). The information in this manual is presented in eight chapters as shown in the following:

- Chapter 1—General Information and Safety Precautions
- Chapter 2—Operation
- Chapter 3—Functional Description
- Chapter 4—Scheduled Maintenance
- Chapter 5—Troubleshooting
- Chapter 6—Corrective Maintenance
- Chapter 7—Illustrated Parts Breakdown
- Chapter 8—Installation

Ships, training activities, supply points, depots, Naval Shipyards and Supervisors of Shipbuilding are requested to arrange for the maximum practical use and evaluation of NAVSEA technical manuals. Reporting of errors, omissions, inconsistencies, and suggestions for improving this manual is encouraged, using NAVSEA Technical Manual Deficiency/Evaluation Report (TMDER). Submit TMDER via the Naval Systems Data Support Activity web site at <http://nsdsa.phdnswc.navy.mil/tmder/tmder.asp>. All feedback comments will be thoroughly investigated and originators will be advised of resulting action.

Distribution of this manual and subsequent changes are automatic to all authorized users. Additional copies are available from the U. S. Army Media Distribution Center, 1655 Woodson Road, St. Louis MO 63114-6128. To change the number of copies authorized on automatic distribution, address request to: Commanding Officer, Attn: Code A15 Bldg 79, Naval Surface Warfare Center, Panama City, 110 Vernon Avenue, Panama City, FL 32407-7001.



## LIST OF ACRONYMS AND ABBREVIATIONS

ACD	Automatic Condensate Drain
AEL	Allowance Equipage List
APL	Allowance Parts List
CCW	Counterclockwise
CGA	Compressed Gas Association
CO	Carbon monoxide
CO <sub>2</sub>	Carbon dioxide
CPS	Collective Protection System
CW	Clockwise
HP	High Pressure
HPBAC	High Pressure Breathing Air Compressor
LED	Light Emitting Diode
MIP	Maintenance Index Page
MRC	Maintenance Requirement Card
MSDS	Material Safety Data Sheet
NAVSEA	Naval Sea Systems Command
NID	Nonionic Detergent
PCB	Printed Circuit Board
PMS	Planned Maintenance System
PMV	Pressure Maintaining Valve
PT	Prevailing Torque

SCBA HP BACS	Self-Contained Breathing Apparatus High Pressure Breathing Air Charging System
SCBA	Self-Contained Breathing Apparatus
TMDER	Technical Manual Deficiency/Evaluation Report

### MEASUREMENTS

°C	Degrees Celsius
°F	Degrees Fahrenheit
cc	Cubic centimeter
ft	Feet
ft <sup>2</sup>	Square Feet
ft <sup>3</sup>	Cubic feet
Hz	Hertz
in.	Inch(es)
kg	Kilogram(s)
lb	pound(s)
mg/m <sup>3</sup>	Milligrams per cubic meter
mm	Millimeter(s)
oz.	Ounce(s)
psi	Pounds per square inch
psig	Pounds per square inch gauge
rpm	Revolutions per minute
scfm	Standard cubic feet (per) minute
VAC	Volts Alternating Current

## SAFETY SUMMARY

### 1.0 INTRODUCTION.

Personnel using the Self-Contained Breathing Apparatus High Pressure Breathing Air Charging System (SCBA HP BACS) for the LPD-4 Class Ships shall observe the safety precautions and procedures specified in this technical manual. Personnel authorized to install, operate, or maintain the SCBA HP BACS must be thoroughly familiar with all safety practices and understand the potential hazards associated with the system prior to working with the equipment.

### 2.0 STANDARD SAFETY PRECAUTIONS.

Only approved replacement parts, lubricants, cleaning solutions, and sealants specified in this technical manual or in the Planned Maintenance System (PMS) for the SCBA HP BACS shall be used with this equipment. Unsafe practices such as substitution of parts or materials and omission or alteration of procedures stated herein are not authorized.

### 3.0 SAFETY PRECAUTIONS FOR FORCES AFLOAT.

Forces afloat must comply with the *Navy Occupational Safety and Health (NAVOSH) Program Manual for Forces Afloat*, OPNAVINST 5100.19 series.

### 4.0 SAFETY PRECAUTIONS FOR SHORE ACTIVITIES.

Shore activities must comply with the *Navy Occupational Safety and Health Program Manual*, OPNAVINST 5100.23 series.

### 5.0 WARNINGS, CAUTIONS, AND NOTES.

Specific warnings, cautions, and notes are provided in this manual to highlight critical operations or procedures that present potential hazards to personnel or that may result in damage to the equipment. Warnings and cautions immediately precede the step or procedure to which they apply and are not repeated here. Notes may precede or follow the associated text. The following notations define warnings, cautions, and notes as used in the text:

<b>WARNING</b>
----------------

**Identifies a location, equipment, or system where a potential hazard exists that is capable of producing injury to personnel if approved procedures are not followed.**

<b>CAUTION</b>
----------------

**Identifies a location, equipment, or system where a potential hazard exists that is capable of producing severe damage to the equipment, system, or ship, and loss of mission capability if approved procedures are not followed.**

**NOTE**

Indicates an essential operating or maintenance procedure, practice, condition, or statement that must be highlighted.

**6.0 GENERAL SAFETY PRECAUTIONS**

The following safety guidelines apply to operation and maintenance procedures in general and do not appear elsewhere in this publication, except by reference. Personnel must understand and comply with these guidelines during operation and maintenance of the system.

**COMPRESSED AIR:** Do not use compressed air for general cleaning. Compressed air may only be used for cleaning of electrical motors. Use of compressed air can create an environment of propelled particles. Do not direct air stream towards self or other personnel. Air pressure shall be reduced to less than 30 psig and used with personnel protective equipment.

**CLEANING SOLVENTS:** Ensure that area is well ventilated when using cleaning solvents. Avoid breathing of fumes and solvent contact with skin or eyes. Keep flame and other sources of ignition away from solvent and solvent vapors. Toxic solvents are not to be used within Collective Protection System (CPS) spaces.

**FIRST AID:** An injury, no matter how slight, shall never go unattended. Always obtain first aid or medical attention immediately.

**TRAINING:** Established operating and maintenance procedures, as well as the basic safety precautions contained in this manual, must be reviewed with operating and maintenance personnel at regular intervals of not more than 6 months. Newly assigned operators and/or maintenance personnel must be trained in the safe operation of the equipment before they are permitted to operate or work on the HPBAC.

**DO NOT EXCEED RATED CONDITIONS:** Do not operate the compressor in excess of its rated conditions. Do not exceed design parameters listed in this manual.

**WIRING MUST BE CORRECTLY INSTALLED:** All electrical wiring must be carefully installed in accordance with the ship's specifications.

**KEEP AWAY FROM LIVE CIRCUITS:** Personnel must be advised that high voltages are present in this equipment and that power must be disconnected before working on or around the compressor. Also, with the selector switch in ON or AUTO positions, the compressor could start automatically.

**DO NOT SERVICE OR ADJUST ALONE:** Under no circumstances should any person reach into the equipment to make a repair or adjustment except in the presence of another person who is capable of rendering aid.

**RESUSCITATION:** Personnel working with or near high voltages must be familiar with modern methods of resuscitation. Refer to Naval Ship's Technical Manual, S9086-KC-STM-010/Chapter 300.

**COVERS AND GUARDS:** Do not remove any inspection covers or guards when the compressor is operating.

**PRESSURE RELIEF VALVES AND VENTS:** Pressure relieving devices and other controls that are vented to atmosphere must have their exhaust connections directed away from possible operator positions.

**HIGH PRESSURE:** Do not tighten or adjust fittings or connections under pressure.

**LIFTING EQUIPMENT:** Lifting hoists and similar equipment must be regularly tested and have a sufficient safety factor for the weight to be lifted. Also, ensure that lifting devices are properly secured before any lifting is attempted. Approximate weight of HPBAC is 1,458 pounds dry or 1,468 pounds wet.

**SLIPPERY AREAS AND OBSTRUCTIONS:** The area around the compressor must be kept clear and free of oil, grease, and obstructions that could cause personnel to slip or trip.

**BREATHING AIR SERVICE:** For a compressor to be capable of use for breathing air service, it must be fitted with a specialized purification system to enable compliance with rules, regulations, and codes to properly filter and/or purify the air to meet all applicable federal, state, and local laws. The HPBAC is so equipped and requires cognizant operation and maintenance.

**INLET AIR:** The HPBAC is equipped with a purification system; however, suitable intake air is just as important as the quality of the purification system to ensure high quality breathing air. The HPBAC purification system exceeds the Compressed Gas Association (CGA) Grade D breathing air requirements when proper inlet conditions are satisfied.

**SAFETY EQUIPMENT:** Ensure all required safety equipment (e.g. hearing protection, safety glasses, hard hats, safety shoes, and fire extinguishers) is available as appropriate.

**LOCKOUT/TAG-OUT:** Personnel shall be aware of the hazards associated with unguarded machinery parts, gaseous and wet pipe systems, spring-loaded devices, etc. Lock out or tag out the energy source prior to performing maintenance, adjustments, or other procedures that would bypass safety guards, barriers, or otherwise expose personnel to hazardous energy sources. Any equipment, machine, or process that could release energy will be equipped with a means to lockout/tag-out the energy source(s). Electrical and pneumatic controls shall be tagged **DANGER – DO NOT OPERATE** prior to maintenance procedures. Lockout/tag-out procedures shall be in accordance with local procedures.

**EQUIPMENT COOLING:** Allow the compressor to cool before servicing. Whenever the compressor is shut down and overheating is suspected, a minimum period of 15 minutes must elapse before opening the crankcase. Premature opening of the crankcase of an overheated unit can result in an explosion.

**MAINTENANCE PREPARATION:** Before doing any work involving maintenance or adjustment, be sure the electrical supply has been disconnected, and the complete compressor system has been vented of all internal pressure.

**HAZARDOUS MATERIALS WARNINGS:** Warnings for hazardous materials in this manual are designed to warn personnel of hazards associated with such items when they come in contact with them during actual use. For each hazardous material used, a material safety data sheet (MSDS) is required to be provided and available for review by users. Contact your local safety and health staff concerning any questions on hazardous chemicals, MSDS, personal protective equipment requirements, and appropriate handling and emergency procedures.

**LOOSE CLOTHING:** Do not wear loose clothing, necktie, jewelry, watches, hand rags, etc. around machinery.

## CHAPTER 1

### GENERAL INFORMATION AND SAFETY PRECAUTIONS

#### 1.1 SAFETY PRECAUTIONS.

The Safety Summary preceding this chapter gives general precautions to be observed while operating and servicing the Self-Contained Breathing Apparatus High Pressure Breathing Air Charging System (SCBA HP BACS) for LPD-4 Class Ships. Specific safety precautions required for operation or maintenance of this equipment are listed immediately preceding the instruction to which the precaution applies. For example, safety precautions to be followed prior to starting the compressor for the first time are given in Chapter 2, Operation. Safety precautions to be observed prior to scheduled maintenance are provided in Chapter 4, and those to be observed prior to and during corrective maintenance are presented in Chapter 6.

#### 1.2 INTRODUCTION.

This technical manual provides operating procedures, a functional description, scheduled maintenance information, troubleshooting procedures, corrective maintenance procedures, an illustrated parts breakdown, and installation instructions for the SCBA HP BACS for LPD-4 Class Ships. Each ship is outfitted with three complete systems, each consisting of a compressor, a filtration panel, a charging panel, and a bank of High Pressure (HP) air storage flasks. Although the components are the same for all three systems, the layout of the filter and charging panel components may differ, as well as the component identification numbers (e.g., AHP-V101).

#### 1.3 EQUIPMENT DESCRIPTION.

##### NOTE

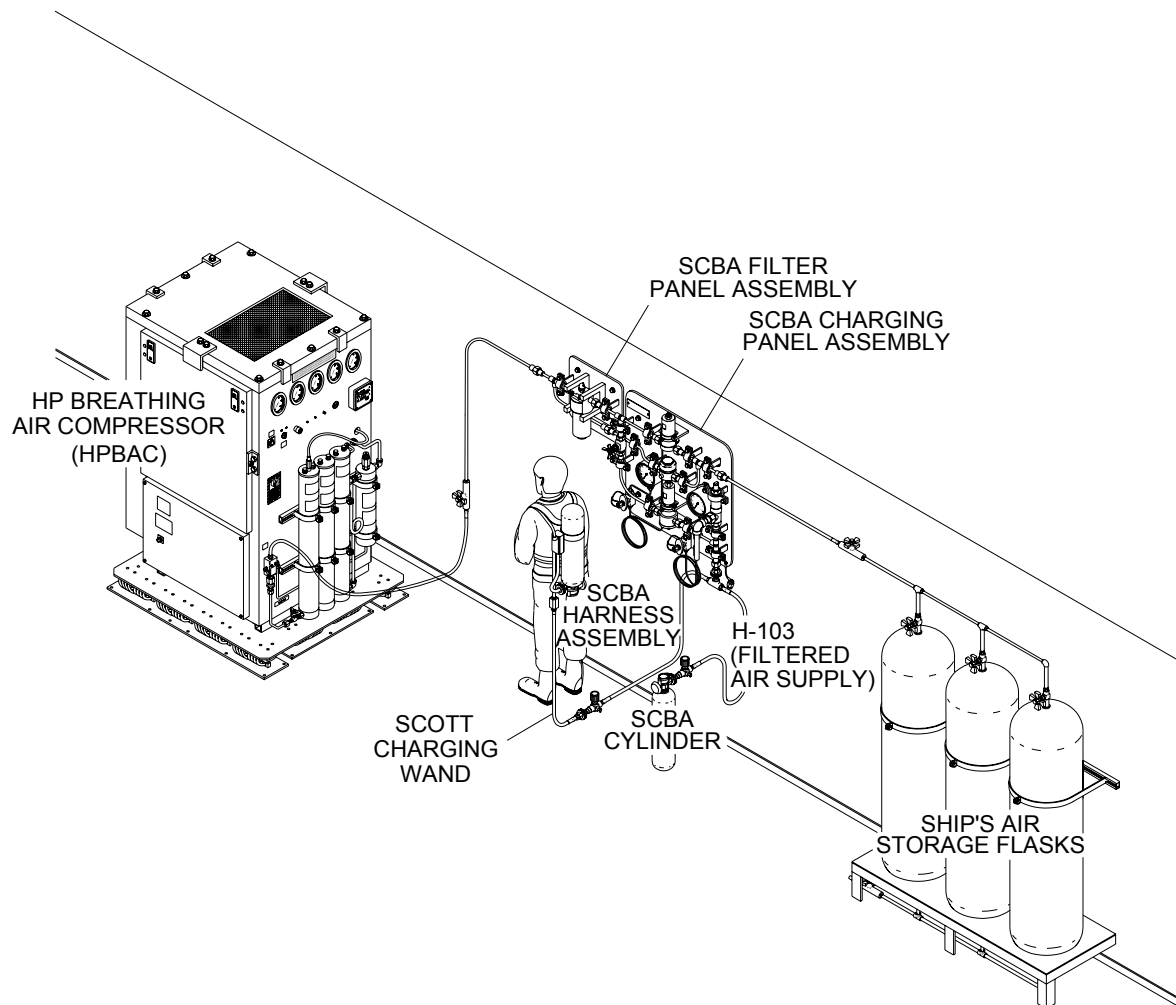
The non-integral support equipment assemblies shown in Figure 1-1 are addressed in this manual only to the level necessary to show their relationship to components of the SCBA HP BACS.

**1.3.1 MAJOR ASSEMBLIES AND SUPPORT EQUIPMENT.** The major assemblies that comprise the SCBA HP BACS are listed below and illustrated in Figure 1-1. The paragraphs that follow briefly describe each major assembly and its role in the system. Detailed functional descriptions are provided in Chapter 3.

##### Major Assemblies:

- High Pressure Breathing Air Compressor (HPBAC)
- Self-Contained Breathing Apparatus (SCBA) Filter Panel Assembly
- SCBA Charging Panel Assembly
- Ship's Air Storage Flasks

- Filtered Air Supply Hose Assembly (H-103)
- SCBA Quick-Charge Hose Assembly (Scott® Charging Wand)



**Figure 1-1. SCBA HP BACS System Illustration**

**1.3.1.1 High Pressure Breathing Air Compressor (HPBAC).** Major assemblies of the HPBAC consist of the frame assembly, instrument and control panel, controller assembly, drive motor/cable assembly, compressor block assembly, and air purification system. The HPBAC and its supporting systems are mounted in a steel frame assembly that is supported by a vibration-isolating cable-mount baseplate. The HPBAC compresses ambient air for storage in SCBA cylinders or ship's air storage flasks to provide breathing air for personnel working in contaminated environments. The compressor is a radial 4-cylinder, 4-stage unit driven by an electric motor. When air is compressed, water from the air and oil mist from the compressor can contaminate the air stream. These and other contaminants, such as carbon monoxide and carbon dioxide, are removed through a purification system that assures breathing quality air that is free of obnoxious taste and odor. When the filtered air leaves the HPBAC, it is piped to a second filtration panel for particulate removal.

**1.3.1.2 SCBA Filter Panel Assembly.** The SCBA Filter Panel Assembly contains a particulate filter that removes small particulates (10 microns or greater) from the compressed air. From there, the clean, compressed air is piped to the SCBA Charging Panel Assembly.

**1.3.1.3 SCBA Charging Panel Assembly.** The SCBA Charging Panel Assembly controls the flow of clean, filtered air to the SCBA cylinders from the compressor and/or the ship's air storage flasks. If the air pressure in the storage flasks is below 4750 pounds per square inch (psi), the air flows directly from the HPBAC for quick charging. If the air pressure in the storage flasks is above 4750 psi, the air flows from both the storage flasks and the HPBAC. Two regulators and a relief valve help maintain the required air pressure for charging or for storage in the ship's air storage flasks.

**1.3.1.4 Ship's Air Storage Flasks.** The SCBA HP BACS contains a bank of three HP air flasks that have a floodable volume of 8 cubic feet each and a service pressure of 5000 psi. The flasks are used to store the clean, filtered air until needed for charging SCBA cylinders, at which time air from both the HPBAC and the storage flasks are used. A relief valve ensures the flasks do not become overpressurized. Two drain valves allow the flasks to be drained for maintenance purposes.



**1.3.2 EQUIPMENT SIZES AND WEIGHTS.** Sizes and weights of the equipment supplied with the SCBA HP BACS are shown in Table 1-2.

#### 1.4 REFERENCE DATA.

Table 1-1 contains descriptive information, functional data, rated output, and environmental operating ranges for the SCBA HP BACS. Supplied equipment and accessories are outlined in Table 1-2, and related documents are listed in Table 1-3.

**Table 1-1. SCBA HP BACS Reference Data**

Item	Specification
Charging Panel Reference Data	
Back Pressure Regulator (AHP-V101)	4750 ± 50 psig
Charging Panel Relief Valve (AHP-V105)	4950 ± 50 psig
Pressure Reducing Regulator (AHP-V104)	4500 ± 50 psig
HPBAC Reference Data	
Air Cut in Pressure	4500 ± 100 psig
Air Cut out Pressure	5100 ± 100 psig
Air Intake Filter	10 microns
Air Processing Capability	140,000 cubic feet
Air Quality	Grade D breathing air per ANSI/CGA 7.1 at dewpoint <-65 °F with ambient air at 70 °F and relative humidity of 95% or moisture content of 20 mg/m <sup>3</sup>
Compressor Type	Radial, Reciprocating
Discharge Pressure	1st stage: 50 to 60 psig 2nd stage: 230 to 275 psig 3rd stage: 1050 to 1200 psig 4th stage: 4400 to 5100 psig
Discharge Pressure, Maximum	5100 ± 100 psig
Drive Motor, 20 hp	Full Load Speed: 3530 rpm Synchronous Speed: 3600 rpm
Free Air Delivery	19.3 scfm @ 3000 psi
High Air Temperature Shutdown Setting	320 °F
Inlet Air Pressure	Ambient
Inlet Air Relative Humidity	95%
Inlet Air Temperatures	40 °F to 140 °F
Input Power	440 Vac, 3 phase, 60 Hz
Low Oil Pressure Shutdown Setting	500 ± 50 psig

**Table 1-1. SCBA HP BACS Reference Data - Continued.**

Item	Specification
HPBAC Reference Data (Continued)	
Lubricating Oil, Petroleum	MIL-PRF-17331 (2190 TEP) formerly MIL-L-17331
Number of Cylinders	4
Number of Stages	4
Oil Capacity	1 gallon (approx.)
Oil Operating Pressure	800 to 920 psig (870 psig nominal)
Operating Modes	Automatic
Piston Stroke	1.97 in.
Pressure Maintaining Valve Setting	2175 ± 200 psig
Rotation Direction	Counterclockwise (facing fan)
Safety Valve Settings	1st stage: 80 ± 4 psig 2nd stage: 350 ± 18 psig 3rd stage: 1300 ± 50 psig 4th stage: 5300 ± 50 psig
Set Point, Auto Start	Approx. 4500 ± 100 psig
Set Point, Auto Stop	Approx. 5100 ± 100 psig
Ship's Air Storage Flask Reference Data	
Air Flask Relief Valve (AHP-V108)	5500 ± 100 psig
HP Air Flasks	Floodable volume: 8 cubic feet each Service pressure: 5000 psig

**Table 1-2. Equipment and Accessories**

Qty.	Nomenclature	Part No.	Overall Dimensions	Weight and Volume
1	High Pressure Breathing Air Compressor (HPBAC)	K966037-2	Installed: 41W x 44D x 57.13H	Dry Weight: approx 1458 lb Wet Weight: approx 1468 lb Volume (gross): 59.6 ft <sup>3</sup>
1	Filtered Air Supply Hose Assembly (H-103)	53711ASSY 7245948-1	Approx 124" length; 1/4" ID	N/A
1	SCBA Quick-Charge Hose Assembly	200150-03	Approx 25'	N/A

**Table 1-3. Related Documents**

<b>Title</b>	<b>Reference</b>
HPBAC System Drawing	K966038-02
Pneumatic Schematic	K300269
Wiring Diagram	K300384-02
Ladder Diagram	K300270-02
Post Repair Operational Tests for LPD4 Class Ships	Design Test Procedure, Test Memo No. 04776
Allowance Equipage List (AEL)	2-330024111
Allowance Parts List (APL), Compressor Assembly	06A030003
APL, Compressor, Air Breathing	06A030004
APL, Controller Assembly	15A030043
APL, Motor, AC	17A030031
APL, LPD-4 Class HP Air Charging Panel	99A040174
Naval Ship's Technical Manual	S9086-KC-STM-010/Chapter 300
SCBA HP BACS Technical Manual	S9551-BP-MMC-010
HPBAC Maintenance Index Page (MIP) and associated Maintenance Requirement Cards (MRCs)	5519/025

## CHAPTER 2

## OPERATION

### 2.1 INTRODUCTION.

This chapter provides operating information for the Self-Contained Breathing Apparatus High Pressure Breathing Air Charging System (SCBA HP BACS) for LPD-4 Class Ships. All operating controls and indicators are identified, as well as indicators that identify maintenance tasks to be performed for optimum performance of the system. Step-by-step operating procedures are provided, including pre-operating, SCBA cylinder charging, SCBA quick-fill, shutdown, and extended shutdown procedures. Other compressor operations are also discussed, including compressor re-start after a trip condition that results in automatic shutdown, preparation for long-term shutdown, preservation, and reactivation after long-term shutdown.

### 2.2 CONTROLS AND INDICATORS.

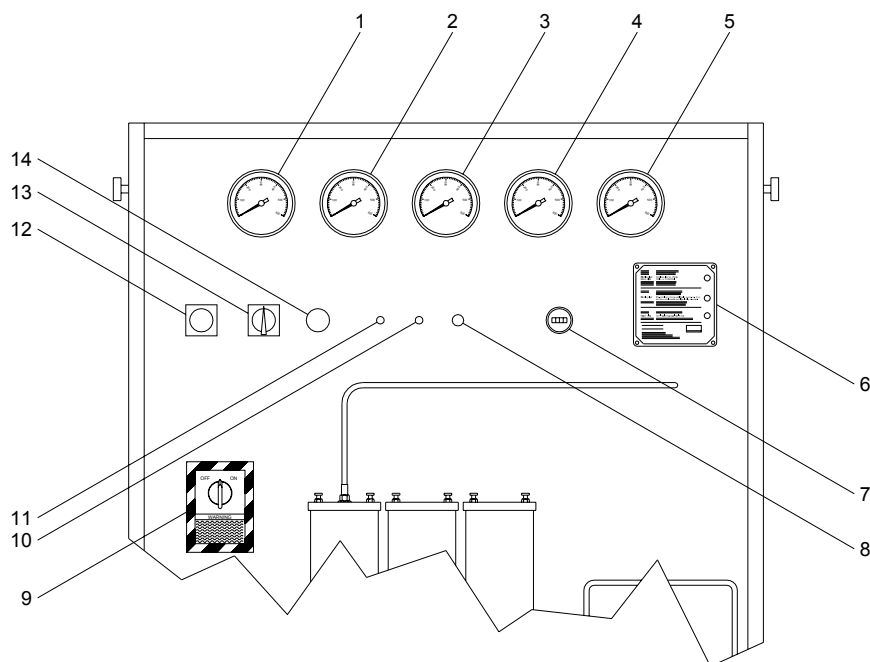
All operating controls and indicators are located on the High Pressure Breathing Air Compressor (HPBAC) Instrument and Control Panel, the Self-Contained Breathing Apparatus (SCBA) Charging Panel, and the Securus® purification monitor. The Securus® purification monitor is mounted above the air purification system cylinders and is visible as the operator scans the HPBAC Instrument and Control Panel.

**2.2.1 OPERATING CONTROLS AND INDICATORS.** The locations and functions of the controls and indicators for the SCBA HP BACS are provided in the following figures:

- Figure 2-1 — HPBAC Instrument and Control Panel Controls and Indicators
- Figure 2-2 — Securus® Purification Monitor Indicators
- Figure 2-3 — SCBA Charging Panel Controls and Indicators
- Figure 2-4 — HPBAC and Purification System Controls and Indicators
- Figure 2-5 — Filtered Air Supply Hose Assembly (H-103) Controls

**2.2.2 MAINTENANCE INDICATORS.** Maintenance indicators that show automatic shutdown and/or indicate required operator maintenance are listed below and are marked with an asterisk in Figures 2-1, 2-2, and 2-4. Related maintenance that may be required during operation (including checking/adding oil, replacing purification filters, replacing the intake air filter, verifying Automatic Condensate Drain (ACD) function, and liquid waste disposal) is referred to in Chapter 4, Scheduled Maintenance, and detailed in Maintenance Index Page (MIP) 5519/025 and associated Maintenance Requirement Cards (MRC) for this system. The maintenance indicators are as follows:

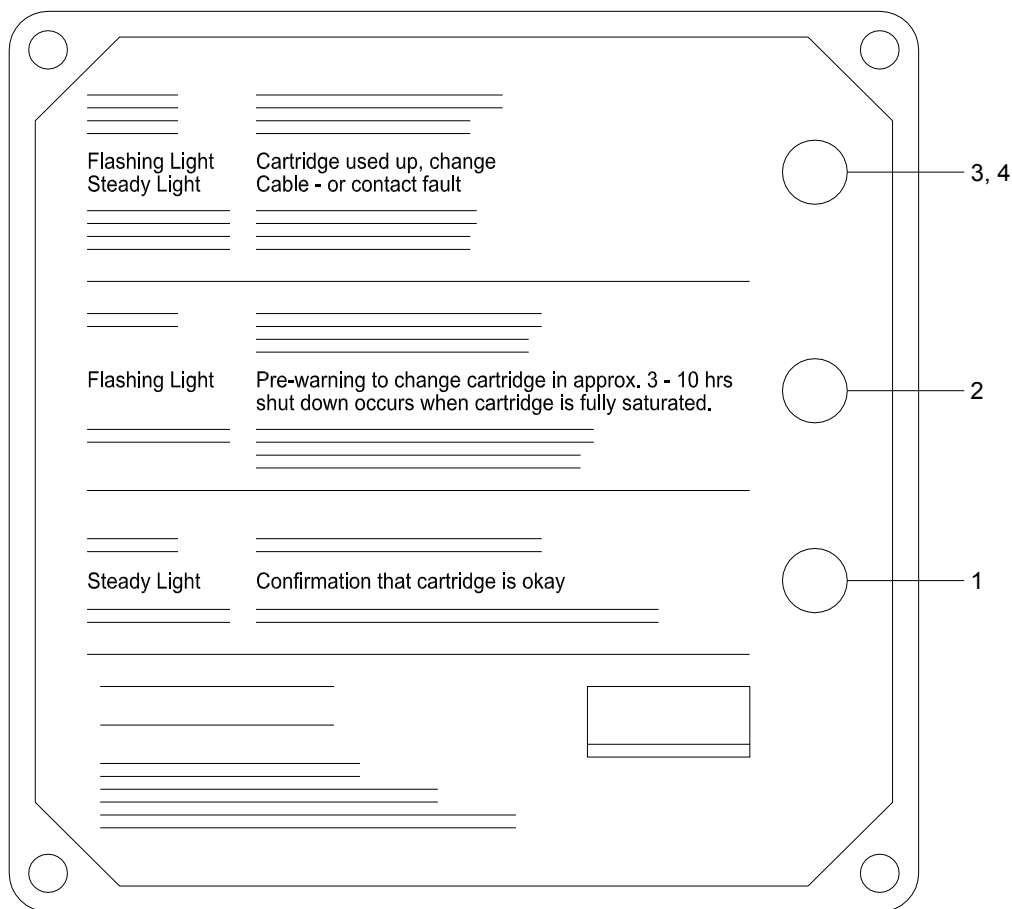
- Crankcase Oil Sight Glass (Figure 2-4)
- Condensate Reservoir (Figure 2-4)
- Inlet Filter Maintenance Indicator (Figure 2-1)
- Securus® Purification Monitor (Figures 2-1 and 2-2)
- High Air Temp. Indicator Light (Figure 2-1)
- Low Oil Press. Indicator Light (Figure 2-1)



No.	Nomenclature	Function	Normal Operating Condition
1	Oil Pressure Gauge	Indicates 4th stage force-fed system oil pressure.	Indicating pressure
2	1st Stage Air Pressure Gauge	Displays 1st stage discharge air pressure.	Indicating pressure
3	2nd Stage Air Pressure Gauge	Displays 2nd stage discharge air pressure.	Indicating pressure
4	3rd Stage Air Pressure Gauge	Displays 3rd stage discharge air pressure.	Indicating pressure
5	4th Stage Air Pressure Gauge	Displays 4th stage discharge air pressure.	Indicating pressure
6*	Securus® Purification Monitor	Detects moisture in air (see Figure 2-2).	Green light (steady)
7	Hourmeter	Displays total elapsed running time of HPBAC.	Time advancing
8	Power ON Indicator	Illuminates green when system power is on.	ON
9	Master ON/OFF Selector Switch	Applies or removes all power to HPBAC.	ON
10*	Indicator Light, Low Oil Pressure (red)	Illuminates when oil pressure falls below 500 ± 50 psi (automatic shutdown of compressor).	Not illuminated
11*	Indicator Light, High Air Temperature (red)	Illuminates when air temperature in compressor exceeds 320 °F (automatic shutdown of compressor).	Not illuminated
12	Start Pushbutton Switch	Starts HPBAC.	--
13	Power ON/OFF Selector Switch	Applies or removes power to control circuit.	ON
14*	Inlet Filter Maintenance Indicator	Reset button trips and a red band becomes visible when filter element requires changing.	Set (not tripped)

\* Indicates automatic shutdown and/or requires operator maintenance

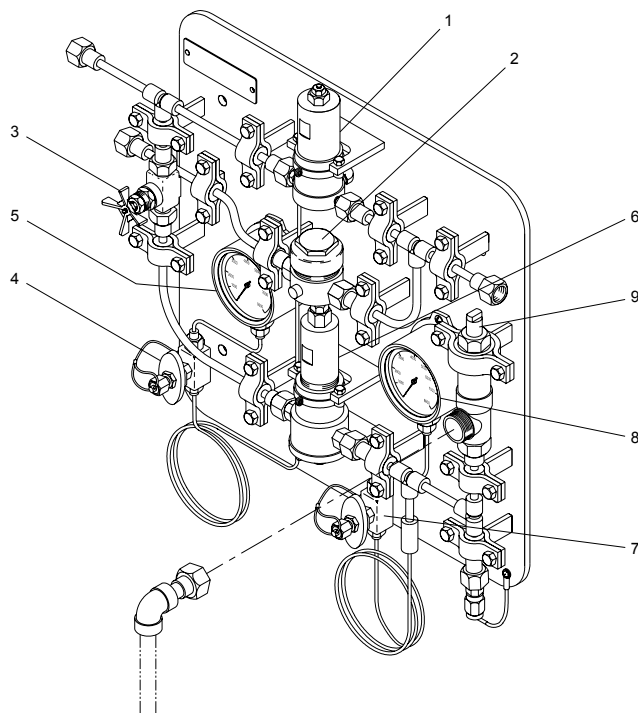
**Figure 2-1. HPBAC Instrument and Control Panel Controls and Indicators**



No.	Nomenclature	Function	Operating Condition
1	Light, Green	Indicates status of purification monitor filter cartridges: Filter cartridges okay.	Green: ON (steady) Yellow: OFF Red: OFF
2	Light, Flashing Yellow	Indicates status of purification monitor filter cartridges: Filter cartridges near saturation; replace in 3-10 hours.	Green: ON (steady) Yellow: ON (flashing) Red: OFF
3	Light, Flashing Red*	Indicates status of purification monitor filter cartridges: Filter cartridges saturated; HPBAC shutdown.	Green: OFF Yellow: OFF Red: ON (flashing)
4	Light, Steady Red*	Indicates status of purification monitor filter cartridges: Faulty cable/contacts or missing filter cartridge; HPBAC shutdown.	Green: OFF Yellow: OFF Red: ON (steady)

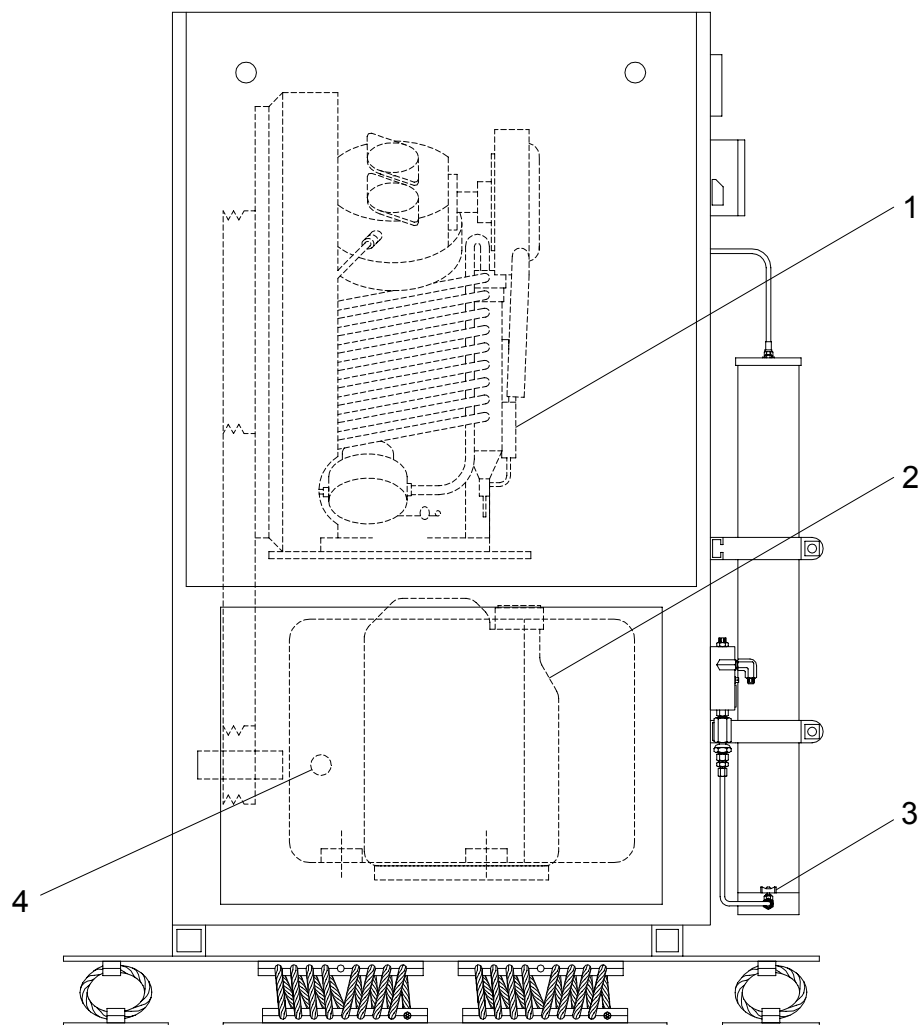
\* Indicates automatic shutdown and/or requires operator maintenance

**Figure 2-2. Securus® Purification Monitor Indicators**



No.	Nomenclature	Function	Normal Operating Condition
1	Back Pressure Regulator (AHP-V101)	Prevents filling of storage flasks and SCBA at the same time; prevents slow charging of the SCBAs.	CLOSED at less than 4750 $\pm$ 50 psi
2	Check Valve (AHP-V102)	Allows air flow from storage flask to inlet filter and blocks air from going directly to storage flasks (forces air passage through back pressure regulator [AHP-V101]).	Normally CLOSED; OPEN when filling from flasks
3	Stop Valve (AHP-V103)	Controls air flow from compressor and storage flasks.	OPEN
4	Gauge Isolation Valve (AHP-V106)	Controls air to gauge (AHP-G101).	OPEN
5	Gauge (AHP-G101)	Indicates air pressure <i>before</i> reduction by pressure reducing regulator (AHP-V104).	Pressurized
6	Pressure Reducing Regulator (AHP-V104)	Regulates outlet air pressure to 4500 $\pm$ 50 psi.	Pressurized
7	Gauge Isolation Valve (AHP-V107)	Controls air to gauge (AHP-G102).	OPEN
8	Gauge (AHP-G102)	Indicates air pressure <i>after</i> reduction by pressure reducing regulator (AHP-V104).	Pressurized
9	Relief Valve (AHP-V105)	Vents pressure greater than 4950 $\pm$ 50 psi.	CLOSED

**Figure 2-3. SCBA Charging Panel Controls and Indicators**

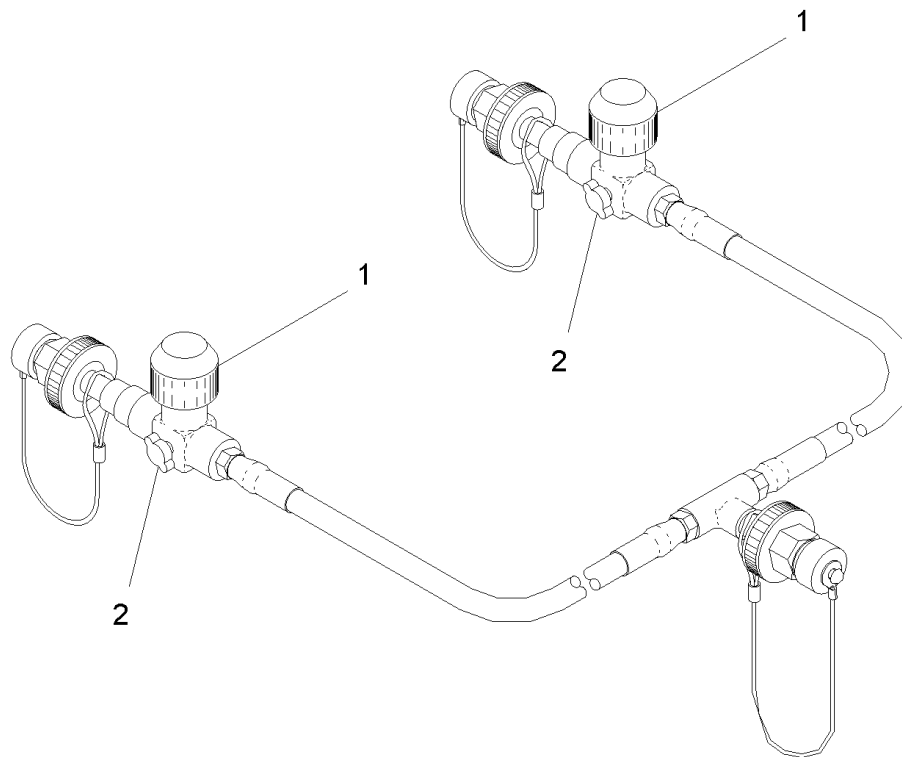


No.	Nomenclature	Function	Normal Operating Condition
1	Oil Sight Glass*	View to determine oil level present.	Filled between minimum and maximum scribe lines on sight glass
2	Condensate Reservoir*	View to determine level of condensate captured.	Filled to 3/4 capacity or less
3	Air Purification System Bleed Valve	Allows operator to bleed pressure from the air purification system for maintenance purposes.	Closed
4	Motor Reset Button	Used to reset motor after electrical overload.	Not tripped

\* Indicates automatic shutdown and/or requires operator maintenance

**Figure 2-4. HPBAC and Purification System Controls and Indicators**





No.	Nomenclature	Function	Normal Operating Condition
1	Shutoff Knob, Hose Isolation Valve	When open, allows charging of SCBAs. When closed, shuts off air supply to SCBA.	Open for charging only
2	Bleed Handle, Hose Isolation Valve	When open, allows air to bleed from filtered air supply hose assembly (H-103).	Closed

**Figure 2-5. Filtered Air Supply Hose Assembly (H-103) Controls**

## 2.3 OPERATING PROCEDURES.

### WARNING

The HPBAC must be operated only by qualified personnel who are trained and authorized to do so. Operation by unauthorized personnel may result in injury to operator or other personnel.

### NOTE

Audible knocking during start-up is due to the final stage floating piston; this knocking disappears as soon as there is pressure between the stages and the piston is running synchronously with the other pistons.

The operating procedures for the SCBA HP BACS include the pre-operating, SCBA cylinder charging, SCBA quick-fill, shutdown, and extended shutdown procedures shown in Table 2-1. In addition, compressor restart and long-term shutdown (preparation, preservation, and reactivation after long-term shutdown) are discussed in paragraphs 2.3.2.1 thru 2.3.2.3.

**Table 2-1. Operating Procedures**

Step	Procedure	Notes
<b>Pre-Operating Procedure</b>		
<div style="border: 1px solid black; padding: 5px; text-align: center;"> <b>WARNING</b> </div> <p><b>Before using the SCBA HP BACS, ensure that a gas sample has been taken within the last three months to ensure that the system is generating grade D air as defined by CGA G-7.1.</b></p> <p><b>Operator must wear protective eyewear and hearing protection to prevent personal injury.</b></p>		
1	Don protective eyewear and hearing protection.	
2	Check work area for unsafe conditions such as slippery deck or contaminated atmosphere; clear area of debris or obstructions.	
3	Check oil level on oil sight glass (1, Figure 2-4); fill as necessary.	
4	Close all manual condensate drain valves.	
5	Ensure inlet filter maintenance indicator (14, Figure 2-1) is depressed (not tripped); i.e. no red band showing.	
6	Ensure condensate drain reservoir (2, Figure 2-4) is below 3/4 full; drain if necessary.	
7	Ensure oil drain petcock is CLOSED (if applicable).	

**Table 2-1. Operating Procedures – Continued.**

Step	Procedure			Notes
8	Ensure SCBA HP BACS valves are aligned as follows:			
	Function	No.	Alignment	
	HPBAC Discharge Valve	HPBA-V1	locked open	
	Inlet Isolation Valve to SCBA Charging Panel	HPBA-V2	locked open	
	Outlet Isolation Valve from SCBA Charging Panel	HPBA-V3	locked open	
	Flask Inlet Valves (3 each)	HPBA-V4	locked open	
	Flask Drain Valves (3 each)	HPBA-V5	locked shut	
	Flask Drain Valves (3 each)	HPBA-V6	locked shut	
	SCBA Charging Panel Stop Valve	AHP-V103	normally shut	
	SCBA Charging Panel Gauge Isolation Valve	AHP-V106	normally open	
	SCBA Charging Panel Gauge Isolation Valve	AHP-V107	normally open	
<b>NOTE</b>				
The system can be configured for the following charging scenarios: (a) 1 or 2 SCBA cylinders, (b) 1 or 2 SCBA quick-charge hoses, or (c) 1 SCBA cylinder and 1 SCBA quick-charge hose.				
9	Attach Filtered Air Supply Hose Assembly (H-103) to SCBA charging panel hose connection.			
10	Ensure that shutoff knobs (1, Figure 2-5) and bleed handles (2, Figure 2-5) on both H-103 isolation valves are closed.			
11	Turn Master ON/OFF selector switch (9, Figure 2-1) to ON.			
12	Turn Power ON/OFF selector switch (13, Figure 2-1) to ON.			
13	Press Start pushbutton switch (12, Figure 2-1). Record start time (hourmeter reading) in operating log (see Figure 2-6).			
<b>NOTE</b>				
The compressor operates automatically under control of the air pressure switch, and will trip (stop) when pressure rises to 5100 psig and will automatically restart when the pressure drops to 4400 psig. An abnormal condition in one of the monitored functions will also automatically stop the HPBAC. If automatic shutdown occurs because the parameters of monitored functions are exceeded, the condition must be corrected before the HPBAC can be restarted.				
14	Ensure dedicated fan coil unit power light is illuminated during HPBAC operations. If not illuminated, ensure fan coil breaker switch is in ON position.			
15	Check gauges (2, 3, 4, and 5, Figure 2-1) to ensure proper discharge pressure of compressor stages.			1st stage (2): 50 to 60 psig 2nd stage (3): 230 to 275 psig 3rd stage (4): 1050 to 1200 psig 4th stage (5): 4400 to 5100 psig

**Table 2-1. Operating Procedures - Continued.**

Step	Procedure	Notes
<b>SCBA Cylinder Charging Procedure</b>		
<div style="border: 1px solid black; padding: 5px; text-align: center;"><b>WARNING</b></div> <p>Operator must wear protective eyewear and hearing protection to prevent personal injury.</p> <p>An inspection of all SCBA cylinders must be conducted before charging, as charging or using damaged cylinders may cause injury or death to personnel.</p>		
1	Before charging, inspect all SCBA cylinders to be charged for signs of damage. If damage is detected, discharge cylinder pressure and remove cylinder from service.	
2	Attach Filtered Air Supply Hose Assembly (H-103) to SCBA cylinder(s) to be charged.	
3	Open each SCBA cylinder valve fully, then back off 1/4 turn.	
4	Open shutoff knob (1, Figure 2-5) on H-103 isolation valve for each SCBA cylinder being charged.	
5	<i>Slowly</i> open SCBA Charging Panel Stop Valve (AHP-V103).	
6	Close SCBA cylinder valve and shutoff knob (1, Figure 2-5) on H-103 isolation valve when cylinder pressure reaches 4500 psig.	
<div style="border: 1px solid black; padding: 5px; text-align: center;"><b>WARNING</b></div> <p>Before opening bleed valves, ensure all personnel stand clear of area to avoid injury from flying debris. Operator shall announce <i>Bleeding down</i> to warn nearby personnel.</p>		
7	Open bleed handle (2, Figure 2-5) on H-103 isolation valve and bleed down H-103 between each cylinder and the corresponding H-103 isolation valve. Close bleed handle when complete.	
8	If charging is complete, proceed to the <i>Shutdown Procedure</i> in this table. If not, continue to next step.	
9	Attach H-103 to SCBA cylinder to be charged and return to the first step of this procedure.	
<b>SCBA Quick-Fill Procedure</b>		
<div style="border: 1px solid black; padding: 5px; text-align: center;"><b>WARNING</b></div> <p>Operator must wear protective eyewear and hearing protection to prevent personal injury.</p> <p>An inspection of all SCBA cylinders must be conducted before charging, as charging or using damaged cylinders may cause injury or death to personnel.</p>		
1	Before charging, inspect all SCBA cylinders to be charged for signs of damage. If damage is detected, discharge cylinder pressure and remove cylinder from service.	

**Table 2-1. Operating Procedures - Continued.**

Step	Procedure	Notes
<b>SCBA Quick-Fill Procedure - Continued.</b>		
2	Connect SCBA quick-charge hose assembly to Filtered Air Supply Hose Assembly (H-103).	
3	Open shutoff knob (1, Figure 2-5) on H-103 isolation valve for each quick-charge hose assembly used.	
4	<i>Slowly</i> open SCBA Charging Panel Stop Valve (AHP-V103).	
5	Connect SCBA quick-charge hose assembly to SCBA.	
6	Disconnect quick-charge hose assembly from SCBA when cylinder pressure reaches 4500 psig.	
7	If charging is complete, proceed to the <i>Shutdown Procedure</i> in this table. If not, continue with next step.	
8	Repeat steps 5 and 6 for additional SCBA cylinders to be charged.	
<b>Shutdown Procedure</b>		
<div style="border: 1px solid black; padding: 5px; text-align: center;"><b>WARNING</b></div> <p><b>Operator must wear protective eyewear and hearing protection to prevent personal injury.</b></p>		
1	Close SCBA Charging Panel Stop Valve (AHP-V103).	
<div style="border: 1px solid black; padding: 5px; text-align: center;"><b>WARNING</b></div> <p><b>Before opening bleed valves, ensure all personnel stand clear of area to avoid injury from flying debris. Operator shall announce <i>Bleeding down</i> to warn nearby personnel.</b></p>		
2	<i>Slowly</i> open bleed handle (2, Figure 2-5) on H-103 isolation valve for each SCBA cylinder or SCBA quick-charge hose assembly and bleed pressure from H-103.	
3	Disconnect each SCBA cylinder or SCBA quick-charge hose assembly that is connected to H-103.	
4	Disconnect H-103 from SCBA charging panel hose connection and return hose to its stowage position.	
5	Ensure SCBA HP BACS valves are aligned as indicated in Figure 2-6.	
6	When charging is complete, compressor should be left in the ON position so that other HP air flasks may be recharged.	

**Table 2-1. Operating Procedures – Continued.**

Step	Procedure	Notes
<b>Extended Shutdown Procedure</b>		
1	After normal shutdown has been performed, turn Power ON/OFF selector switch (13, Figure 2-1) to OFF position.	
2	Turn Master ON/OFF selector switch (9, Figure 2-1) to OFF position.	
3	Lock out ship's power supply to HPBAC IAW shipboard procedures.	
4	Ensure air purification system bleed valve (3, Figure 2-4) is closed.	

**2.3.1 COMPRESSOR RESTART AFTER TRIP CONDITION.** If the compressor shuts down for any condition listed in Table 2-2, do not attempt to restart the compressor until the problem has been corrected (for help, see the troubleshooting and corrective maintenance procedures in Chapters 5 and 6, respectively). After the problem has been corrected, restart the compressor In Accordance With (IAW) Table 2-1.

**2.3.2 LONG-TERM SHUTDOWN.** If the HPBAC will be out of service for 30 days or more, it should be preserved IAW the following procedure. The HPBAC must be kept indoors in a dry, dust-free room. Cover the equipment with plastic sheets only if no condensation will form under the sheet. Remove the sheet from time to time to ventilate the equipment. For complete long-term shutdown requirements, refer to the system lay-up maintenance and periodic maintenance (for inactive equipment) MRCs 5519/025.

**Table 2-2. Trip Conditions**

Condition	Indicator
High air temperature	Indicator Light (11, Figure 2-1) illuminates (red) when temperature at 4th stage output exceeds 320 °F.
Low oil pressure	Indicator Light (10, Figure 2-1) illuminates (red) below 500 ± 50 psi.
Saturated or missing purification filter	Red light flashes (3, Figure 2-2) or remains steady (4, Figure 2-2) when dewpoint exceeds -68 °F or if purification filter is missing.
Electrical overload	Motor stops when motor pulls 23 amps or more for 720 seconds (12 minutes) or longer. Motor Reset pushbutton must be pressed before restarting unit (4, Figure 2-4).

<b>WARNING</b>
----------------

**Do not attempt to remove or disassemble pressurized equipment. Stop all equipment operation and vent pneumatic pressure to atmosphere prior to performing maintenance. Failure to comply can result in injury to personnel.**

**Hazardous voltage can cause severe injury or death. Disconnect all power to the HPBAC and tag out before servicing equipment.**

**High surface temperatures of the compressor and drive motor can cause burns. Allow the unit to cool before servicing.**

**2.3.2.1 Preparation.** Tag out system IAW current shipboard instructions when required during the performance of this procedure.

- a. Fill compressor oil sump with approximately 1 gallon of MIL-PRF-17331 (2190 TEP) lubricating oil. Oil level should fall between etched lines on oil sight glass. If oil level is above or below etched lines, adjust oil level by adding or removing oil from compressor as needed.
- b. Operate compressor until warm (approximately 10 minutes).
- c. Check all pipes, filters, and valves (including safety valves) for leakage.
- d. Tighten all couplings as required.
- e. After 10 minutes of operation, open outlet valve and operate compressor at minimum pressure ( $2175 \pm 200$  psi as set by pressure maintaining valve) for approximately 5 minutes.
- f. After 5 minutes of operation at minimum pressure, shut down compressor and completely drain all separators and purification chambers. Close all vents.
- g. Remove filter heads and lubricate threads with silicone compound.
- h. Ensure purification cartridges remain in purification chambers. This will prevent oil from entering outlet lines as a result of preservation procedures.
- i. Remove intake filter assembly.

**2.3.2.2 Preserving the Compressor.** Tag out system IAW current shipboard instructions when required during the performance of this procedure.

- a. Operate compressor and slowly spray approximately 0.35 oz. (10cc) of oil into inlet port while compressor is running. Keep air outlet open and condensate drain valves closed.
- b. After spraying oil into inlet port, run compressor unit for an additional 5 minutes before shutting it down.
- c. Drain preservative oil while it is still warm.
- d. Cap air outlet.
- e. Reinstall intake filter assembly.
- f. Cap inlet port.

**2.3.2.3 Reactivating HPBAC After Long-Term Shutdown.** Tag out system IAW current shipboard instructions when required during the performance of this procedure. For complete reactivation requirements, refer to the system start-up maintenance (for inactive equipment) MRCs 5519/025.

- a. Remove protective cap from inlet port.
- b. Fill compressor oil sump with approximately 1 gallon of MIL-PRF-17331 (2190 TEP) lubricating oil. Oil level should fall between etched lines on oil sight glass. If oil level is above or below etched lines, adjust oil level by adding or removing oil from compressor as needed.
- c. Change all purification cartridges if HPBAC has been stored longer than 12 months.
- d. See paragraph 2.3 for start-up procedures. Motor must be thoroughly dry before applying power.
- e. Run HPBAC with open outlet for approximately 5 minutes. Check for proper operation of lubrication system.
- f. Check all relief valves (safety valves) for tampering or leakage. Return any suspect valves to authorized repair facility for set point verification.



- g. Observe operation of HPBAC to verify pressure gauge readiness and function of cut-in/cut-out switches and valves. Repair any deficiencies IAW Chapter 5, Troubleshooting, and Chapter 6, Corrective Maintenance.

## **2.4 OPERATING LOG.**

An operating log shall be kept for the compressor. At a minimum, the log should include a daily entry containing hourmeter readings, pressure readings, and any pertinent operator comments about operation of the compressor. Pressure readings should be taken after the compressor has run long enough for operating temperatures to stabilize. Figure 2-6 contains a sample operating log that may be reproduced as needed.

HIGH PRESSURE BREATHING AIR COMPRESSOR

COMPRESSOR NUMBER \_\_\_\_\_  
USS \_\_\_\_\_

DATE: \_\_\_\_\_

		Elapsed Time (4 hours of running time in 15-minute increments)																
INDICATOR	NORM	0	15	30	45	60	15	30	45	60	15	30	45	60	15	30	45	60
Oil Pressure Gauge	800 to 920 psig																	
1st Stage Air Pressure Gauge	50 to 60 psig																	
2nd Stage Air Pressure Gauge	230 to 275 psig																	
3rd Stage Air Pressure Gauge	1050 to 1200 psig																	
4th Stage Air Pressure Gauge	4400 to 5100 psig																	
Inlet Filter Maintenance Indicator and Reset Button	Reset Button <b>IN</b>																	
Pilot Light, High Air Temp <sup>1</sup>	Extinguished																	
Pilot Light, Low Oil Pressure <sup>2</sup>	Extinguished																	
Oil Level	Between min and max																	
Condensate Reservoir	Fluid below full line																	
Securus® Purification Monitor <sup>3</sup>	Green light illuminated																	
Comments:																		

INSTRUCTIONS:  
to starting compressor and recheck every 15 minutes during run time.  
Note any condition outside normal parameters and correct problem before attempting to start or restart the compressor.  
Record start time and final end time in spaces provided to the right. Automatic shutdowns should be noted in Comments section.

<sup>1</sup> Pilot light illuminates at 320°F as temperature increases; automatic shutdown occurs.  
<sup>2</sup> Pilot light illuminates at 500 psi as pressure decreases; automatic shutdown occurs.  
<sup>3</sup> Will continue to operate with green and yellow lights illuminated. Red light illuminates when dewpoint exceeds –68°F; automatic shutdown occurs.

Record readings or place a checkmark in appropriate box prior  
RUNNING TIME METER READINGS

START TIME \_\_\_\_\_  
END TIME \_\_\_\_\_  
HOURS TODAY

Figure 2-6. Sample Operating Log

THIS PAGE INTENTIONALLY LEFT BLANK

## **CHAPTER 3**

### **FUNCTIONAL DESCRIPTION**

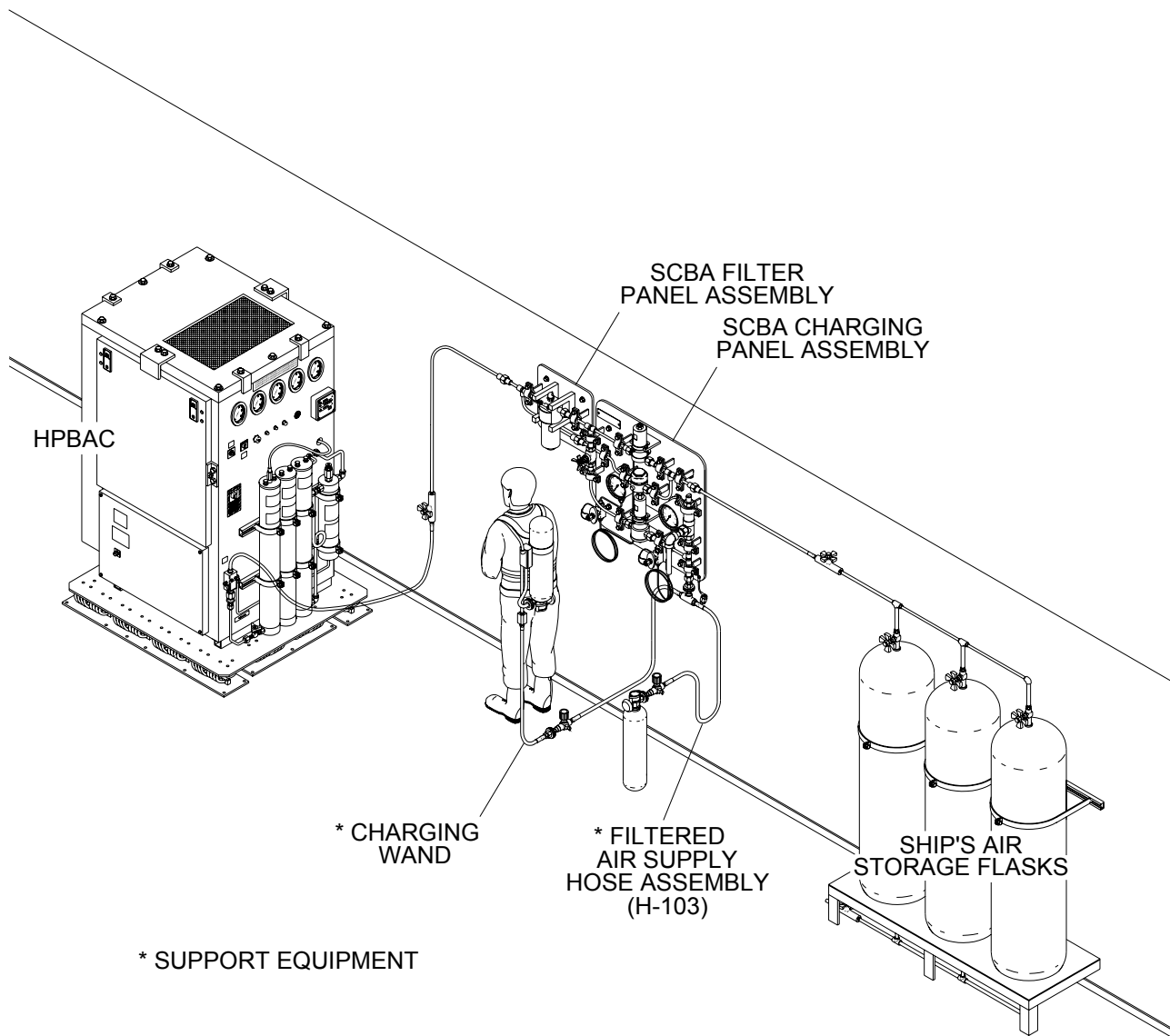
#### **3.1 INTRODUCTION.**

This chapter contains a functional description of the Self-Contained Breathing Apparatus High Pressure Breathing Air Charging System (SCBA HP BACS) for LPD-4 Class Ships. The SCBA HP BACS, which has a nominal operating pressure of 5000 pounds per square inch gauge (psig), is used to routinely refill Self-Contained Breathing Apparatus (SCBA) cylinders to a nominal pressure of 4500 psig via a High Pressure Breathing Air Compressor (HPBAC), an SCBA Filter Panel Assembly, an SCBA Charging Panel Assembly, and a bank of air storage flasks. The filled SCBA cylinders are then immediately used by personnel working in contaminated environments or are stored for later use. The following paragraphs identify and describe the principal components of the SCBA HP BACS and how they operate together to supply SCBA cylinders with breathing-quality air.

#### **3.2 MAJOR ASSEMBLIES AND SUPPORT EQUIPMENT.**

The major function of the SCBA HP BACS is to compress ambient air and remove moisture and contaminants from the air prior to delivering it at the proper pressure and flow rate to the cylinders used by personnel for breathing purposes. The major assemblies comprising the SCBA HP BACS and support equipment that is required for charging the cylinders are illustrated in Figure 3-1 and are listed below in order of their appearance in this chapter. Functional descriptions of the assemblies and their components are included in the paragraphs, and a system flow analysis is presented in paragraph 3.3 to further explain the function of each major component.

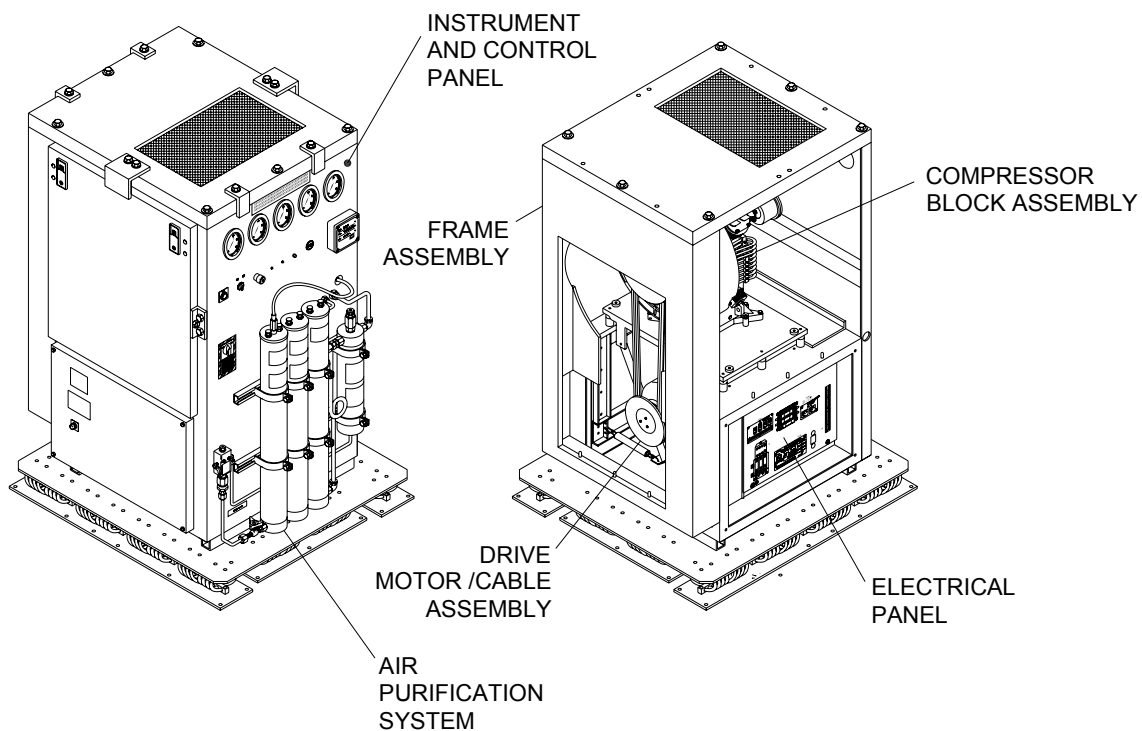
- Paragraph 3.2.1 — High Pressure Breathing Air Compressor
- Paragraph 3.2.2 — SCBA Filter Panel Assembly
- Paragraph 3.2.3 — SCBA Charging Panel Assembly
- Paragraph 3.2.4 — Ship's Air Storage Flasks
- Paragraph 3.2.5 — Support Equipment



**Figure 3-1. SCBA HP BACS Major Assemblies**

**3.2.1 HIGH PRESSURE BREATHING AIR COMPRESSOR (HPBAC).** The major function of the HPBAC is to compress ambient air and remove moisture and contaminants from the air prior to delivery to the SCBA Filter Panel Assembly. The paragraphs that follow contain functional descriptions of the HPBAC major subassemblies, which are illustrated in Figure 3-2 and shown below in the order in which they are presented in this chapter:

- Paragraph 3.2.1.1 — Frame Assembly
- Paragraph 3.2.1.2 — Instrument and Control Panel
- Paragraph 3.2.1.3 — Electrical Panel
- Paragraph 3.2.1.4 — HPBAC Drive Motor/Cable Assembly
- Paragraph 3.2.1.5 — HPBAC Compressor Block Assembly
- Paragraph 3.2.1.6 — Air Purification System



**Figure 3-2. HPBAC Major Subassemblies**

**3.2.1.1 Frame Assembly.** The welded frame assembly provides an enclosure for the compressor block and drive motor with the front panel housing the controls and providing an attachment point for the Air Purification System. The frame assembly features a rigid, shock-mounted platform that supports and protects the other HPBAC components. For ease of handling, the unit may be bolted to a pallet. If a hoist is used to move the equipment, eyebolts that are capable of supporting the HPBAC weight of approximately 1460 pounds may be placed at the four corners of the frame assembly.

**3.2.1.2 Instrument and Control Panel.** The instrument and control panel (Figure 3-3) is integrated into the front panel of the HPBAC. The instrument portion of the panel includes five pressure gauges, the Securus® purification monitor, an hourmeter, warning lights for low oil pressure and high air temperature, and an inlet filter maintenance indicator. The control portion of the panel includes a Master ON/OFF selector switch, an illuminated Power ON/OFF selector switch, and a Start pushbutton switch. The rear of the panel also serves as an attachment point for the condensate pre-separator assembly, the silencer/separator, and the Automatic Condensate Drain (ACD).

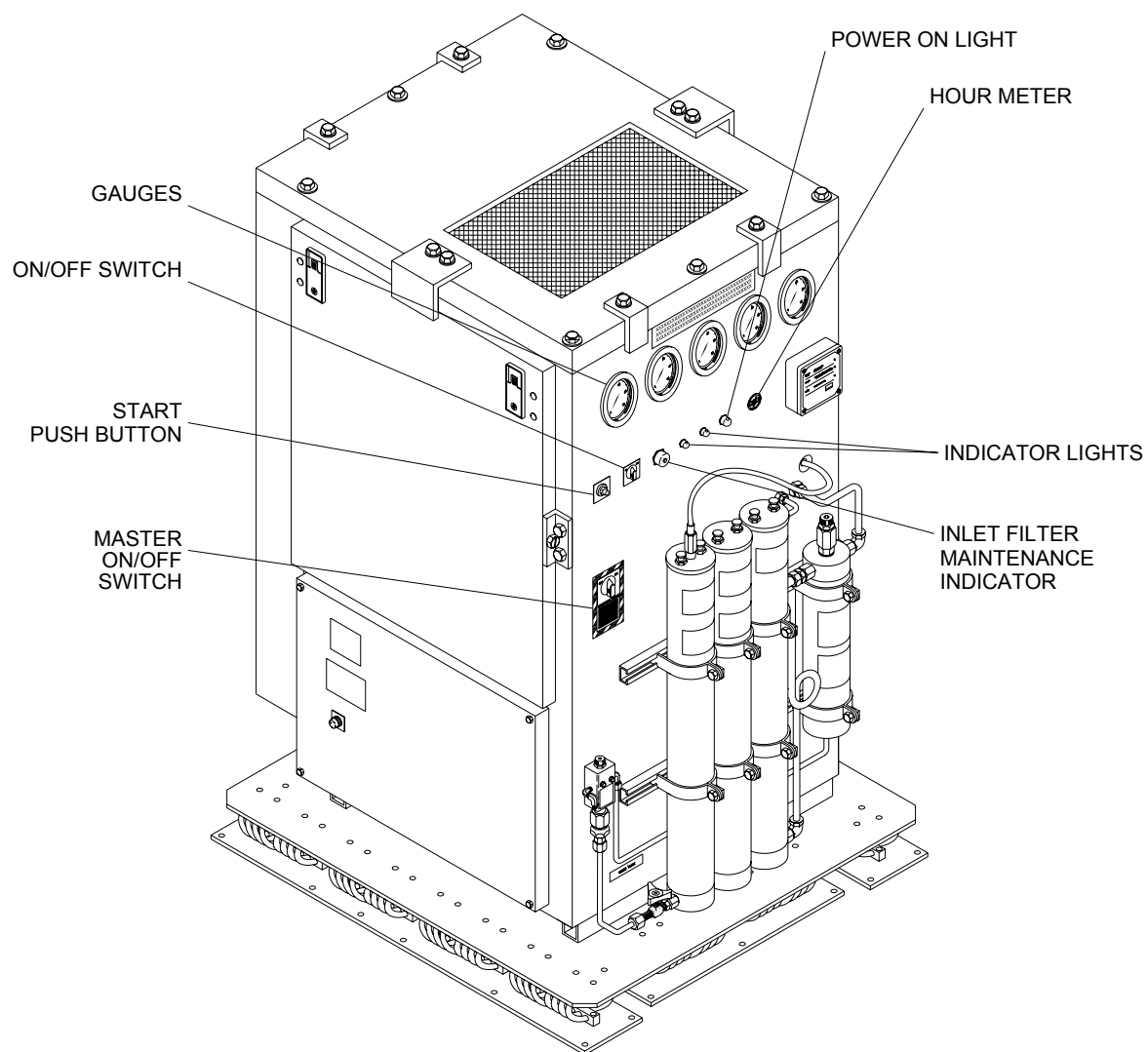
**3.2.1.2.1 Oil Pressure Gauge.** This gauge indicates the pressure of the oil coming from the oil pressure regulator (see paragraph 3.2.1.5.10 for more information).

**3.2.1.2.2 Air Pressure Gauges.** The 1st, 2nd, 3rd, and 4th stage air pressure gauges indicate the pressure of the air being discharged from the corresponding cylinder.

**3.2.1.2.3 Securus® Purification Monitor.** This monitor indicates the operating condition of the air purification system via the color and state of the Light Emitting Diodes (LED) on the front of the Securus® purification monitor (see paragraph 3.2.1.6.6 for more information).

**3.2.1.2.4 Start Pushbutton Switch.** The operator presses this button to initially start the HPBAC. Following an automatic shutdown, the operator also presses this button to restart the HPBAC but only after corrective maintenance has been performed.

**3.2.1.2.5 Power ON/OFF Selector Switch.** The Power ON/OFF selector switch allows the operator to turn off the HPBAC during operation; the switch must be in the ON position before starting the compressor.



**Figure 3-3. Instrument and Control Panel**



3.2.1.2.6 Inlet Filter Maintenance Indicator. This indicator measures the differential pressure in the air stream before and after it passes through the air intake filter. When that differential is 50 millibars (0.725 psi) or higher, a red reset button on the indicator pops out, indicating the filter is no longer effective and must be cleaned or replaced. After the filter has been cleaned or a new filter installed, the operator must press the button to reset the indicator. Although tripping of the indicator reset button will not cause automatic shutdown, timely maintenance is required to ensure the intake air supply is not adversely affected. The inlet filter maintenance indicator should be routinely checked during performance of the pre-operating procedures in Table 2-1, and the air intake filter should be inspected and cleaned on a quarterly basis or after every 250 hours of HPBAC operation. The filter should also be replaced annually in accordance with (IAW) the Planned Maintenance System (PMS) requirements listed on Maintenance Index Page (MIP) 5519/025.

3.2.1.2.7 High Temperature Indicator Light. This light illuminates red to warn the operator that the 4th stage discharge air temperature has reached or exceeded 320 °F (measured in the outlet pipe of the 4th stage cylinder). The high temperature relay causes automatic shutdown of the compressor and the fault must be found and corrected before the operator can restart the unit.

3.2.1.2.8 Low Oil Pressure Indicator Light. This light illuminates red to warn the operator that the oil pressure has fallen below  $500 \pm 50$  psi. A 40-second delay relay in the electrical panel compensates for the low oil pressure fault signal that appears at start-up. If the oil pressure switch fails to register  $500 \pm 50$  psi after the 40-second delay or at any time thereafter, the light is illuminated, automatic shutdown occurs, and the fault must be found and corrected before the operator can restart the unit.

3.2.1.2.9 Hourmeter. This indicator shows (in hours) the total elapsed running time of the HPBAC with the last two digits on the right indicating the running time to 1/100th of an hour. The meter is driven by a timer behind the panel that operates only when the HPBAC is running.

3.2.1.2.10 Master ON/OFF Selector Switch. This switch applies or removes all power to the HPBAC from the ship's power source; however, it should not be used to manually operate the compressor and drive motor (use the Power ON/OFF selector switch and the Start pushbutton switch instead). When this switch is set to ON, the Power ON/OFF selector switch illuminates green.

3.2.1.2.11 Condensate Pre-Separator Assembly. The condensate pre-separator assembly, which is attached to the rear of the instrument and control panel, filters the condensate received from the ACD valve assembly (paragraph 3.2.1.5.5) prior to sending it into the condensate reservoir assembly (paragraph 3.2.1.6.9). Any aerosol condensation particles and mist near the top of the pre-separator are drawn into the silencer/separator for further filtering.

3.2.1.2.12 Silencer/Separator. The silencer/separator, which is also attached to the rear of the instrument and control panel, serves as a muffler for the HPBAC and also collects any remaining aerosol condensation particles and mist from the condensate pre-separator assembly and empties the condensate into the condensate reservoir assembly (paragraph 3.2.1.6.9).

**3.2.1.3 Electrical Panel**. The HPBAC Electrical Panel (Figure 3-4) is located on the lower left side when facing the front panel of the HPBAC. The Electrical Panel has an electrical enclosure access panel which allows access to the HPBAC electrical components, mounted inside the enclosure. The only components in the Electrical Panel that will be discussed in detail are those which control the operation of the compressor, which are:

- Oil Pressure Switch 40-second Delay Relay
- High Air Temperature Relay
- Motor Overload Relay
- Moisture Monitor Relay
- Air Pressure Switch Relay

3.2.1.3.1 Oil Pressure Switch 40-Second Delay Relay. A 40-second delay relay connected to the electronic monitoring and control module Printed Circuit Board (PCB) compensates for the low oil pressure fault signal that appears at start-up. If the oil pressure switch fails to register at least  $500 \pm 50$  psi after the 40-second delay (or at any time thereafter when the unit is in operation), the relay passes the fault signal to the monitoring circuit, the red Low Oil Pressure indicator light is illuminated, the circuit is tripped, and the unit is disabled. After the fault is found and corrected, the HPBAC may be restarted using the Start pushbutton switch.

3.2.1.3.2 High Air Temperature Relay. When the temperature of the air being discharged by the compressor's 4th stage reaches or exceeds 320 °F (as measured by the high air temperature sensor in the outlet pipe of the 4th stage cylinder), the high air temperature relay causes the red High Temperature indicator light to illuminate and trips the circuit, which in turn disables the unit. After the fault is found and corrected, the HPBAC may be restarted using the Start pushbutton switch.

3.2.1.3.3 Motor Overload Relay. When the motor draws 23 amps for 720 seconds (12 minutes) or longer, the motor overload relay passes the fault signal and trips the compressor. After the fault is found and corrected, the drive motor must be reset using the Motor Reset pushbutton switch and the HPBAC restarted using the Start pushbutton switch.

3.2.1.3.4 Moisture Monitor Relay. Signals from the air purification system are displayed on the Securus® purification monitor, and when the monitor senses a dew point exceeding -68 °F, an instrument and control panel relay picks up that signal to trip the compressor off. After the fault is found and corrected, the HPBAC may be restarted using the Start pushbutton switch.

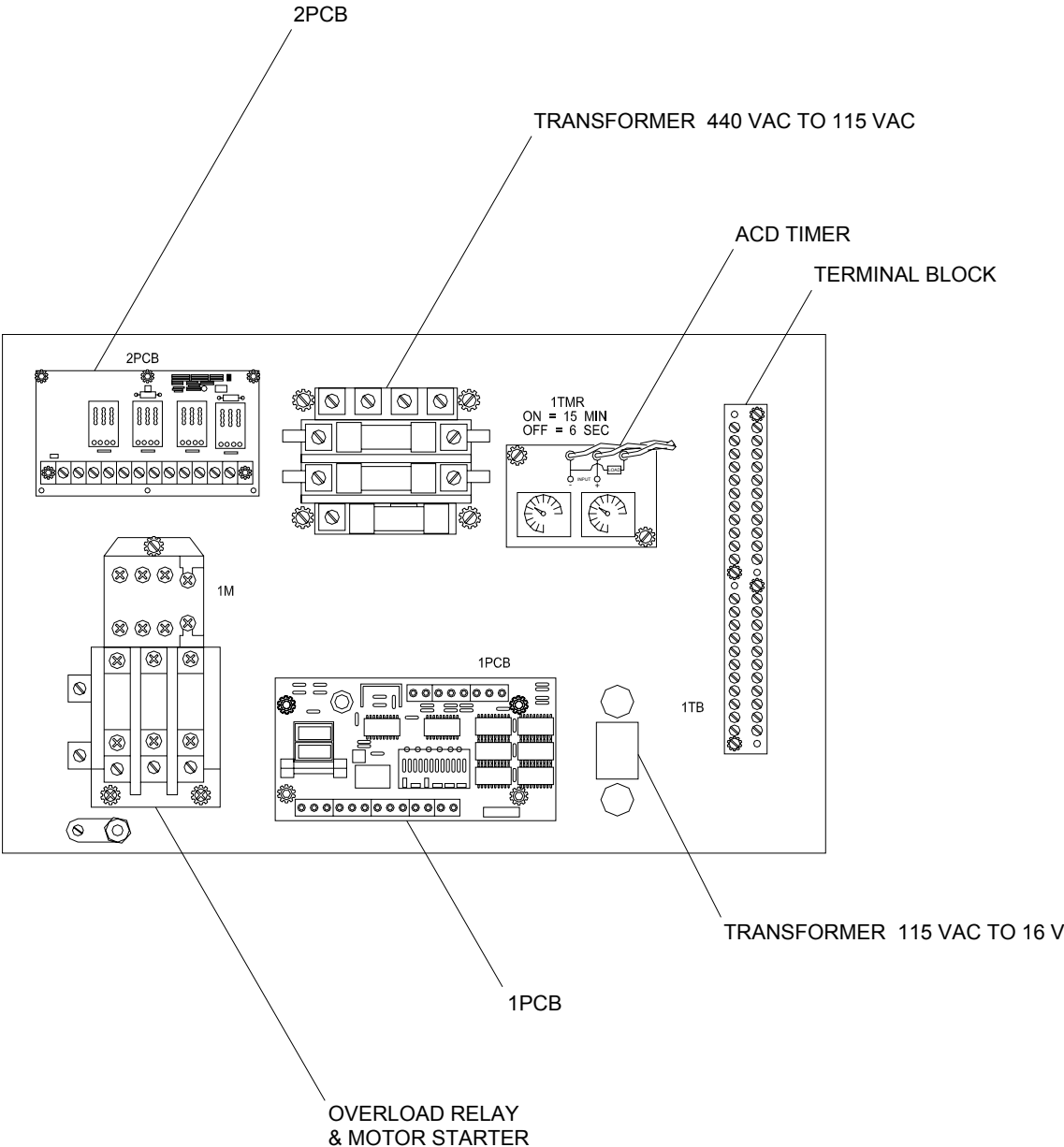


Figure 3-4. Electrical Panel

3.2.1.3.5 Air Pressure Switch Relay. This relay receives signals from the Air Pressure Switch PS1 to control ON/OFF cycling of the compressor. The compressor will automatically start if the pressure at PS1 is less than approximately 4550 psi and will stop when the pressure at PS1 reaches approximately 5000 psi.

3.2.1.4 HPBAC Drive Motor/Cable Assembly. The drive motor/cable assembly consists of a drive motor and an electrical cable. The drive motor is a 3-phase, 60 Hz, 440 Vac motor that supplies 20 horsepower at 3530 revolutions per minute. The drive motor turns the compressor using a pair of matched drive V-belts connecting the pulley sheaves of the drive shaft to the pulley sheaves attached to the compressor crankshaft. The electrical cable is connected from the drive motor to the instrument and control panel to give the operator ON/OFF control. Power is provided to the motor from the ship's electrical system by turning the Master ON/OFF selector switch to ON. The motor is started by pressing the Start pushbutton switch. The motor can be manually stopped by turning the Power ON/OFF selector switch to the OFF position. Should the motor pull 23 amps or more for 720 seconds (12 minutes) or longer, a motor overload sensor will trip a switch in the instrument and control panel to shut down the compressor. After the fault is located and corrected, the HPBAC can be restarted by first pushing the Motor Reset pushbutton switch and then the Start pushbutton switch.

3.2.1.5 HPBAC Compressor Block Assembly. The compressor block assembly (Figure 3-5), which is driven by the drive motor/cable assembly described in paragraph 3.2.1.4, compresses ambient air from atmospheric pressure to 5000 psig for storage in the ship's air storage flasks or in SCBA cylinders that will immediately or ultimately provide breathing air to personnel working in contaminated environments. The compressor block and drive/motor cable assemblies are enclosed at the top and on three sides by access panels and are covered in front by the instrument and control panel. Safety features incorporated in the HPBAC protect against high output temperature, low oil pressure, and motor overload. If unsatisfactory conditions occur during operation, the compressor shuts down automatically and can only be restarted using the Start pushbutton switch on the instrument and control panel after the problem is found and corrected; if motor overload occurs, the Motor Reset pushbutton switch must be pressed before restarting the HPBAC. The compressor block assembly consists of the components described in paragraphs 3.2.1.5.1 through 3.2.1.5.8 and illustrated in Figure 3-5. In addition, the cooling components are discussed in paragraph 3.2.1.5.9, the lubrication components in paragraph 3.2.1.5.10, and the compressor valves and valve heads in paragraph 3.2.1.5.11.

3.2.1.5.1 Oil Sight Glass. The oil sight glass is used to monitor the oil level, which must be maintained between the minimum and maximum marks.

3.2.1.5.2 Oil Filler Cap. The oil filler cap must be removed to replenish oil to the oil sump.

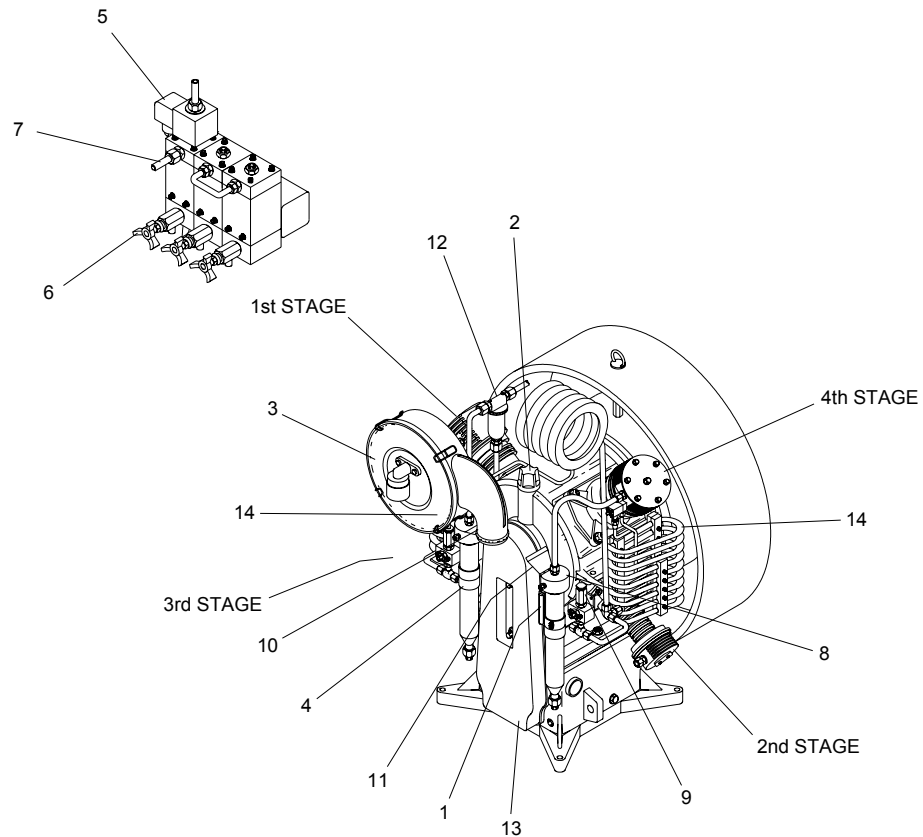


Figure No.	Description
1	Oil Sight Glass
2	Oil Filler Cap
3	Air Intake Filter
4	Interstage Filter, 2nd Stage
5	Electronic Solenoid Valve
6	Manual Condensate Drain Valves (3 each)
7	Automatic Condensate Drain Valve (15-minute cycle)
8	Interstage Filter, 3rd Stage
9	Safety Valve, 1st Stage
10	Safety Valve, 2nd Stage
11	Safety Valve, 3rd Stage
12	Crankcase De-mister
13	Oil Pump Drive V-belt Cover
14	Intercooler

**Figure 3-5. Compressor Block Components**

3.2.1.5.3 Air Intake Filter. The air intake filter is a dry micron filter that is used to filter intake air. Located on the instrument and control panel is an inlet filter maintenance indicator (paragraph 3.2.1.2.1) that monitors the condition of the air intake filter. When the filter requires maintenance, the reset button trips and must be pressed to reset once the filter has been cleaned or replaced. The inlet filter maintenance indicator should be checked routinely during performance of the pre-operating procedures in Table 2-1, and the air intake filter should be inspected and cleaned on a quarterly basis or after every 250 hours of HPBAC operation. The filter should also be replaced annually IAW the PMS requirements listed on MIP 5519/025.

3.2.1.5.4 Interstage Filters. The compressor block assembly contains two interstage filters; one is mounted on the compressor block between the 2nd and 3rd stages and the other on the 3rd and 4th stages. The interstage filters remove water and oil droplets that accumulate as the air cools after the compression process. Separation is achieved by centrifugal action provided by a centrifugal insert or a baffle; the excess water and oil droplets are removed and drained through the ACD Valve Assembly (paragraph 3.2.1.5.5).

3.2.1.5.5 ACD Valve Assembly. The ACD valve assembly consists of the electronic solenoid valve, three ACD valves, and three manual condensate drain valves. The electronic solenoid valve, which is controlled by the ACD timer mounted behind the instrument and control panel, controls the three ACD valves that automatically drain and depressurize the two interstage filters and the oil and water separator. The three manual condensate drain valves allow the operator to manually drain the two interstage filters and the oil and water separator when required. The condensate from the ACD valve assembly is drained into the condensate reservoir assembly after passing through the condensate pre-separator assembly (paragraph 3.2.1.2.11) and the silencer/separator (paragraph 3.2.1.2.12). A detailed functional description of the ACD valve assembly and its components is presented in the following text and is also presented in simpler form in Table 3-1. Components of the ACD valve assembly have been assigned identifiers that are common to the functional description (Table 3-1) and the pneumatic schematic in Figure 5-1.

- a. Turning on the power to the HPBAC energizes the ACD timer and closes the electronic solenoid valve (SV1), which was open during system shutdown. As system pressure builds, control pressure is applied and closes the normally open ACD valves to the two interstage filters; CDV1 controls the 2nd/3rd interstage filter (CDS1) and CDV2 controls the 3rd/4th interstage filter (CDS2). CDV3, which controls the oil and water separator (CDS3), is held closed by a spring-assisted plunger. This phase of operation continues for 15 minutes.

- b. At the end of the 15 minutes, the ACD timer de-energizes and opens SV1 for approximately 6 seconds, during which time SV1 causes CDV1 to open and drain CDS1. The pressure loss in CDS1 during this drain period reduces the control pressure responsible for closing CDV2, which in turn causes CDV2 to open and drain CDS2. When the system is at operating pressure, CDV3 remains closed by control pressure taken from CDS2 and by a spring-assisted plunger; therefore, pressure loss in CDS2 during the 6-second draining period decreases the control pressure to CDV3. This pressure differential opens CDV3 and drains CDS3, which will continue draining until the spring pressure (approximately 1000 psig) in CDV3 can overcome the separator pressure.
- c. The process outlined in a and b is repeated continuously until the HPBAC is shut down, at which time SV1 de-energizes (opens) and causes CDV1 and CDV2 to open; this action allows CDS1 and CDS2 to be fully drained of condensation and depressurized. CDV3, which is connected to CDS3, remains closed by a spring-assisted plunger that acts against pressure in the separator; this action prevents CDS3 from draining or depressurizing during shutdown.

**Table 3-1. Automatic Condensate Drain (ACD) Valve Assembly Operating Cycles**

Step	HPBAC Status	Cycle	SV1 Status	CDV1 Status	CDV2 Status	CDV3 Status
a	ON	15-minute no drain period	ACD timer energizes SV1; valve closes and remains closed for 15 minutes	Valve closes and remains closed for 15 minutes	Valve closes and remains closed for 15 minutes	Held closed by spring-assisted plunger
b	ON	6-second drain	ACD timer de-energizes SV1; valve opens for 6 seconds	Valve opens and drains CDS1; resulting pressure loss reduces control pressure for CDV2	Valve opens and drains CDS2; resulting pressure loss reduces control pressure for CDV3	Valve opens and drains CDS3 until spring pressure (approx. 1000 psig) overcomes separator pressure and valve closes
<p style="text-align: center;"><b>NOTE</b></p> <p style="text-align: center;">Steps a and b are repeated continuously until power is turned off (step c).</p>						
c	OFF	Shutdown	SV1 de-energizes; valve opens	Valve opens; CDS1 drains and depressurizes	Valve opens; CDS2 drains and depressurizes	Held closed by spring-assisted plunger (CDS3 does not drain or depressurize)

**3.2.1.5.6 1st, 2nd, and 3rd Stage Pressure Relief Valves.** The compressor block is protected by a pressure relief valve at each stage. The intermediate (1st, 2nd, and 3rd stage) pressure relief valves are adjusted and set 10% above the proper operating pressure of the corresponding compression stage for each of the intermediate stages. The final (4th) stage pressure relief valve, which is located on top of the oil and water separator in the air purification system, is discussed separately in paragraph 3.2.1.6.2. Refer to Table 3-3 for pressure relief valve set points.

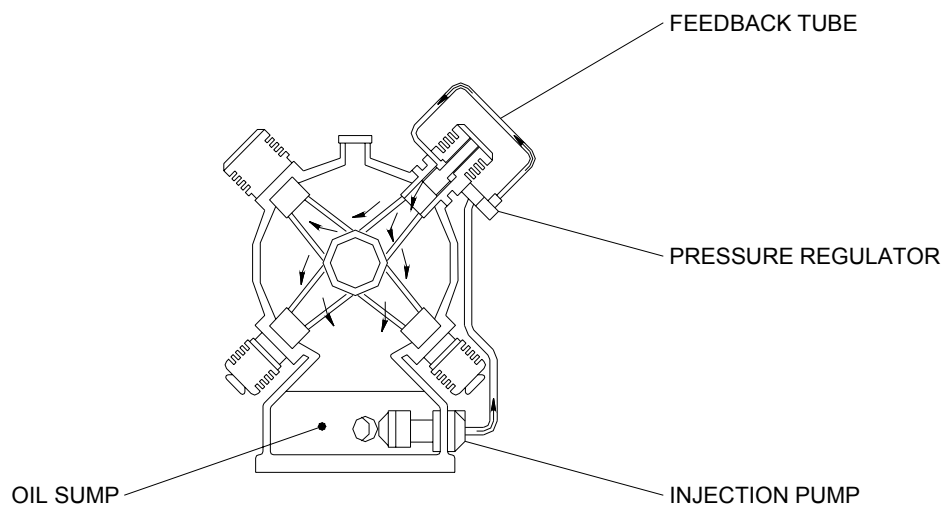
**3.2.1.5.7 Crankcase De-Mister.** The crankcase de-mister allows oil mist particles to be directed back to the oil sump.

**3.2.1.5.8 Oil Pump Drive V-Belt Cover.** The oil pump drive V-belt cover must be removed to provide access to the oil pump drive V-belt.

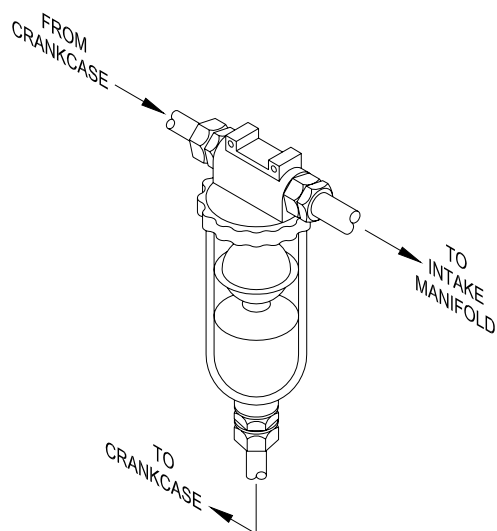


**3.2.1.5.9 Cooling Components.** During the compression process, the air in each stage heats up as it is being compressed to higher and higher pressures. To alleviate this, the heated, compressed air is forced through an intercooler (one of which is illustrated in Figure 3-5) between stages and through an aftercooler when it leaves the 4th stage. If the discharged air temperature exceeds 320 °F, a temperature switch on the 4th stage trips and shuts down the compressor and the red High Air Temperature indicator light on the instrument and control panel illuminates to indicate the cause of the shutdown. The three intercoolers and one aftercooler (Figure 7-2, Sheets 3 and 4) are constructed of different lengths of tubing coiled in various configurations to allow ambient air from the cooling fan (Figure 7-2, Sheet 2) to cool the compressed air as it circulates through the tubing. The cooling fan is driven by a flywheel, which is turned by a pair of V-belts attached to the drive motor.

**3.2.1.5.10 Lubrication Components.** The compressor block is provided with force-feed lubrication for the 4th stage as shown in Figure 3-5. An injection pump, which is driven by a camshaft that is in turn driven by a V-belt, pumps oil into the 4th stage oil pressure regulator, which maintains the proper working pressure. Any oil not needed by the 4th stage cylinder returns to the crankcase through the feedback tube. The oil splashed by the drive gear lubricates the other moving parts (such as the crankshaft, connecting rods, cylinders, and pistons) and returns into the oil sump. The 1st stage cylinder and piston are also lubricated by oil vapors from the crankcase vent feedback line. In addition, a vent line from the crankcase flows through an oil separator (Figure 3-7) that is connected to the intake manifold; oil particles trapped by the oil separator are fed back into the crankcase and the clean air is drawn back into the 1st stage cylinder. The oil pressure gauge on the instrument and control panel (Figure 3-3) is connected to the oil pressure regulator to enable monitoring of the oil pressure, which is also monitored by the compressor oil pressure switch (2PS). At zero pressure, the pressure switch is open. If the compressor does not build sufficient oil pressure within 40 seconds after start-up to close the pressure switch, the fault signal will go through the 40-second delay relay in the electrical panel (Figure 3-4) and shut down the compressor. Similarly, if the oil pressure drops below the preset value during operation, the pressure switch will open, the red Low Oil Pressure indicator light on the instrument and control panel (Figure 3-3) will illuminate, and the HPBAC will shut down. After the problem is resolved, the compressor may be restarted using the Start pushbutton switch on the instrument and control panel.



**Figure 3-6. Lubrication Oil Circuit**



**Figure 3-7. Oil Separator**

3.2.1.5.11 Compressor Valves and Valve Heads. The valve head for each stage forms the top part of the corresponding cylinder, and the intake and discharge valves, which are fitted inside the valve head, are operated by the action of the piston within the cylinder. When the piston moves downward, the resulting vacuum opens the air intake valve. When the piston moves upward, the intake valve closes and the discharge valve opens when sufficient air pressure is created.

**3.2.1.6 HPBAC Air Purification System.** The process of compression generates waste products, which include water and contaminants from the atmosphere and oil mist from the compressor. Using the coalescing oil and water separator and the dryer and purifier chambers in the air purification system, these waste products are removed to provide breathing-quality air that is tasteless and odor-free. The air purification system consists of the nine components described in the following paragraphs and illustrated in Figure 3-8.

3.2.1.6.1 Oil and Water Separator. The air leaving the final (4th) stage is cooled in the aftercooler to approximately 18-27 °F (10-15 °C) above ambient temperature and then enters the oil and water separator. The oil and water separator works by means of a sintered metal micro-filter element that separates liquid oil and water particulates from the compressed air.

3.2.1.6.2 4th Stage Pressure Relief Valve. The pressure relief valve for the compressor's 4th stage is located on top of the coalescing oil and water separator and acts as the safety valve for the final stage of the compressor. The valve is set at  $5300 \pm 50$  psi.

3.2.1.6.3 Check Valves. The two check valves in the air purification system allow compressed air to flow in only one direction. One valve is used to maintain pressure in the dryer and purifier chambers when the compressor is not operating, and the other prevents back-flow from filled storage cylinders or tanks into the air purification system.

3.2.1.6.4 Dryer Chambers. The two identical dryer chambers are constructed of anodized aluminum alloy. The castings, as well as the cover and bottom, are aluminum. The dryer cartridges are packed with a molecular sieve, which absorbs oil and water.

3.2.1.6.5 Purifier Chamber and Securus® Sensor. The purifier chamber is constructed of the same materials as the dryer chambers and the cartridge contains a molecular sieve the same as the dryer chamber cartridges; however, the purifier cartridges are also packed with a chemical catalyst that converts carbon monoxide to carbon dioxide and activated carbon, which absorbs oil vapors affecting taste and odor. In addition, a Securus® sensor is integrated into the cartridge medium to enable signals to be sent to the Securus® purification monitor indicating the condition of the medium.

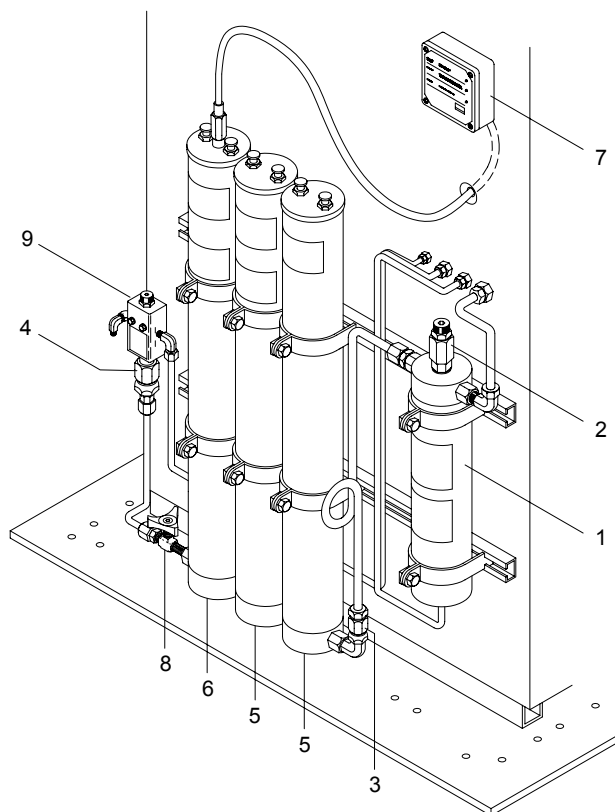


Figure No.	Description
1	Oil and Water Separator
2	Safety Valve, 4th Stage (set at 5300 ±50 psi)
3	Check Valve
4	Check Valve
5	Dryer Chambers
6	Purifier Chamber and Securus® Sensor
7	Securus® Purification Monitor (110-127 Vac, 50/60 Hz, indicates filter condition) Green: OK – dew point: -85 °F Yellow: Caution/pre-warning to change filter – dew point: -75 °F Red: Shutdown/change filter – dew point: -68 °F
8	Bleed Valve
9	Pressure Maintaining Valve (PMV) (2175 ± 200 psi)

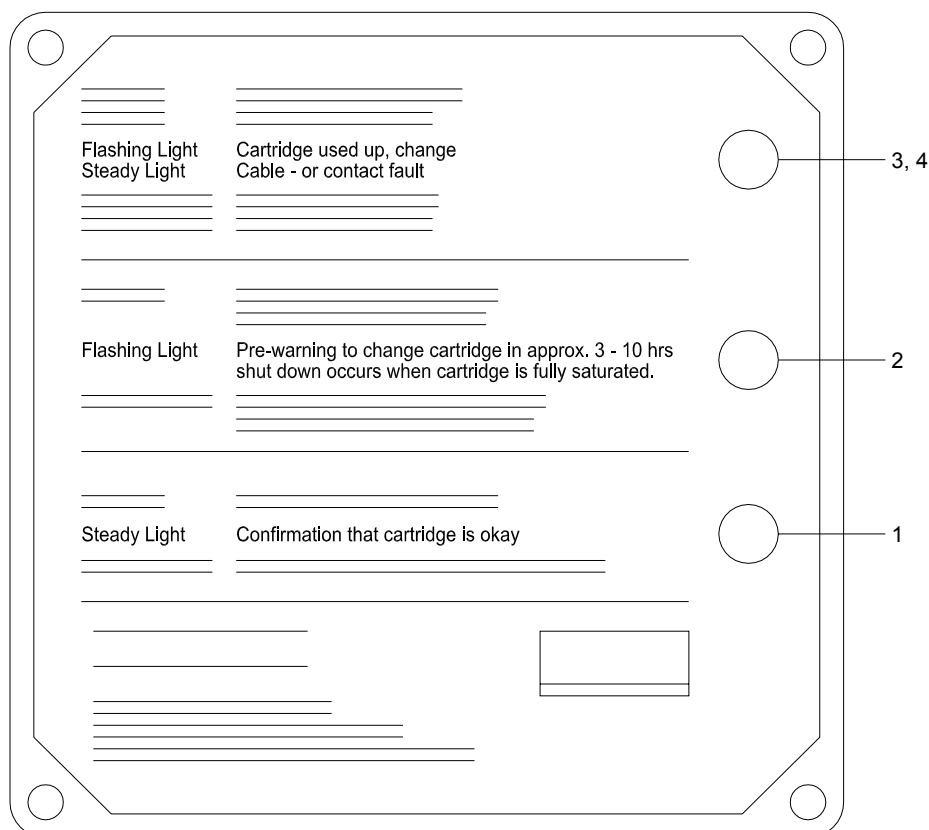
**Figure 3-8. Air Purification System**

3.2.1.6.6 Securus® Purification Monitor. When the monitor senses a dew point of -68 °F, an instrument and control panel relay picks up that signal to trip the compressor. The Securus® purification monitor receives signals concerning the condition of the drying agent inside the purifier element from the attached sensor and furnishes appropriate control signals whenever the present threshold values have been reached. The air purification system operating condition is indicated by the color and state of the LEDs on the front of the Securus® purification monitor as indicated in Figure 3-9 and Table 3-2.

3.2.1.6.7 Bleed Valve. The manually operated bleed valve is used to release the pressure in the dryer and purifier chambers prior to maintenance. The valve must be closed when the system is not in use to prevent contamination of the cartridges.

3.2.1.6.8 Pressure Maintaining Valve (PMV). The PMV, which is set at  $2175 \pm 200$  psig, ensures that pressure is built up in the air purification system from the start of delivery; this action increases the dwell time of air molecule to chemical agent exposure, thereby achieving constant and optimum purification. In addition, the PMV ensures proper working conditions for the final stage of compression.

3.2.1.6.9 HPBAC Condensate Reservoir Assembly. The condensate reservoir assembly illustrated in Figure 7-1, Sheet 1 serves as the collection system for the condensate that drains from the interstage filters (Figure 3-5) and the oil and water separator (Figure 3-7) via the ACD valve assembly (Figure 3-5). The condensate from the ACD valve assembly goes through a condensate pre-separator assembly (paragraph 3.2.1.2.11) and an silencer/separator (paragraph 3.2.1.2.12) before reaching the condensate reservoir assembly. The reservoir should be checked before and during operations and emptied IAW shipboard procedures when it reaches 3/4 full.



**Figure 3-9. Securus® Purification Monitor**

**Table 3-2. Securus® Purification Monitor Warnings**

No.	Nomenclature	Function	Operating Condition
1	Light, Green	Indicates status of purification monitor filter cartridges: Filter cartridges okay.	Green: ON (steady) Yellow: OFF Red: OFF
2	Light, Flashing Yellow	Indicates status of purification monitor filter cartridges: Filter cartridges near saturation; replace in 3-10 hours.	Green: ON (steady) Yellow: ON (flashing) Red: OFF
3	Light, Flashing Red*	Indicates status of purification monitor filter cartridges: Filter cartridges saturated; HPBAC shutdown.	Green: OFF Yellow: OFF Red: ON (flashing)
4	Light, Steady Red*	Indicates status of purification monitor filter cartridges: Faulty cable/contacts or missing filter cartridge; HPBAC shutdown.	Green: OFF Yellow: OFF Red: ON (steady)

\* Indicates automatic shutdown and/or requires operator maintenance

**3.2.2 SCBA FILTER PANEL ASSEMBLY.** The SCBA Filter Panel Assembly (Figure 3-10) features a particulate filter (F-207) that is used to remove small particulates of 10 microns or greater from the compressed air. The function of the particulate filter should not be confused with that of the HPBAC Air Purification System, which removes contaminants from the air.

**3.2.3 SCBA CHARGING PANEL ASSEMBLY.** After passing through the particulate filter on the SCBA Filter Panel Assembly, the 5000 psi compressed air flows to the SCBA Charging Panel Assembly (Figure 3-10), where it is reduced to  $4500 \pm 50$  psi and directed to either the bank of storage flasks or directly to an SCBA IAW one of the following scenarios:

- If the air pressure in the storage flasks is below 4750 psi, the SCBA Charging Panel Assembly directs air from the compressor directly to the SCBA cylinder, thus avoiding slow recharging of the SCBA. Air enters the instrument and control panel through filter (F-207) and is directed to an SCBA cylinder that is attached to the outlet. When the pressure in the SCBA cylinder reaches 4750 psi, the back pressure regulator (AHP-V101) diverts air into the High Pressure (HP) air storage bank until the storage flask pressure reaches 5000 psi.
- If the air pressure in the storage flasks is above 4750 psi, air from the compressor and the storage flasks flows directly to the SCBA cylinder.

A functional diagram is shown in Figure 3-11.

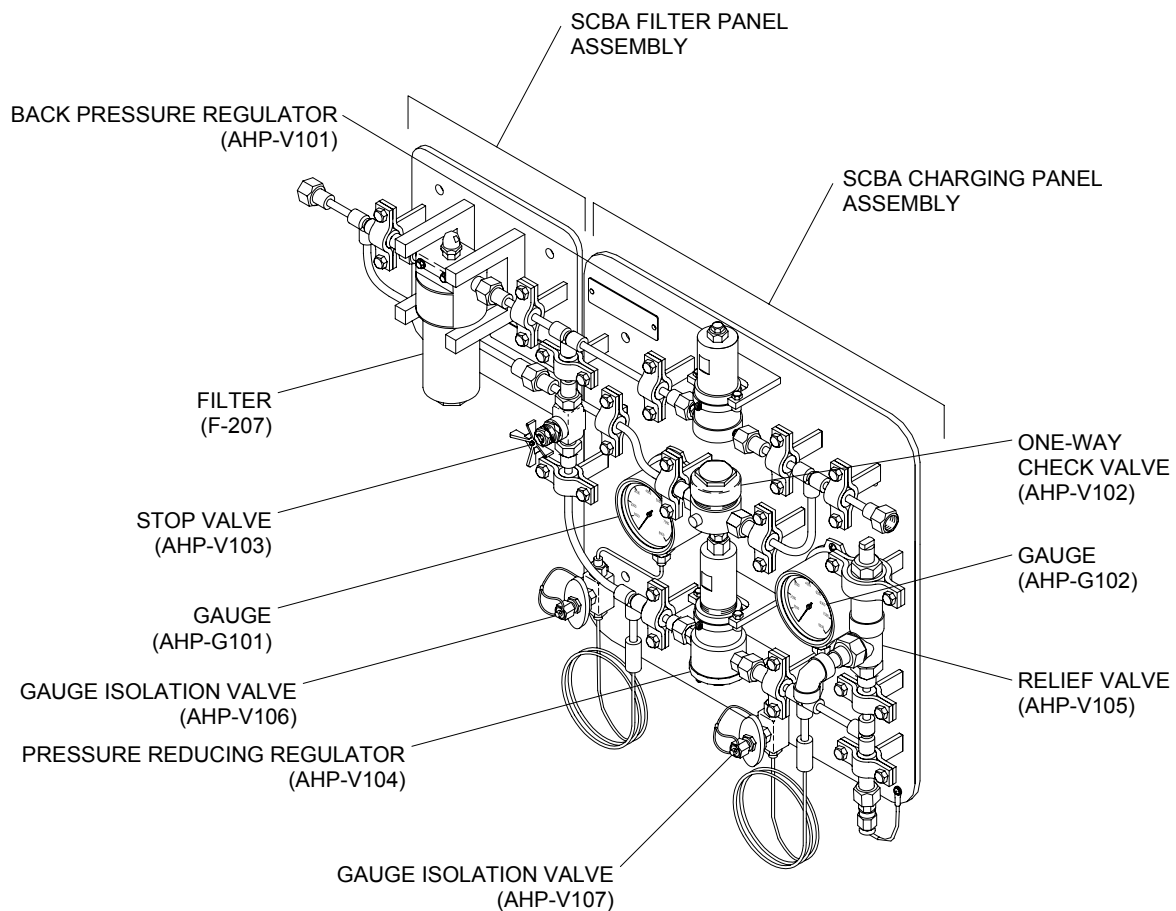
The components of the charging panel assembly will be described in the following paragraphs in the order that they appear on the panel (from left to right and top to bottom).

**3.2.3.1 Back Pressure Regulator.** The back pressure regulator (AHP-V101) allows compressed air to be directed to the HP storage flasks. When the compressed air from the HPBAC exceeds 4750 psi, the back pressure regulator will open, allowing air to pass through to the storage flasks. If the pressure of the compressed air from the HPBAC is below 4750 psi, the back pressure regulator will remain closed, and the air will be directed to the SCBA charging panel outlet connection.

**3.2.3.2 Check Valve.** The check valve (AHP-V102) directs the flow of air from the air storage flasks and also prevents air from the HPBAC from bypassing the back pressure regulator (AHP-V101).

**3.2.3.3 Stop Valve.** The stop valve (AHP-V103) allows air to be discharged from the charging panel for SCBA charging operations.

**3.2.3.4 Pressure Reducing Regulator.** The pressure reducing regulator (AHP-V104) regulates the system's air pressure to 4500 psi for charging of SCBA cylinders.



**Figure 3-10. SCBA Filter Panel and Charging Panel Components**



**3.2.3.5 Relief Valve.** The relief valve (AHP-V105) is set to relieve at 4950 psig to prevent overpressurization of the SCBA cylinders.

**3.2.3.6 Gauge Isolation Valves.** The gauge isolation valves (AHP-V106 and AHP-V107) are used to isolate the HP air pressure gauges (AHP-G101 and AHP-G102) to allow for maintenance and testing.

**3.2.3.7 Gauges.** The pressure gauges (AHP-G101 and AHP-G102) measure inlet/outlet pressure of the pressure reducing regulator (AHP-V104).

**3.2.4 SHIP'S AIR STORAGE FLASKS.** The ship's air storage bank consists of three storage flasks with a floodable volume of 8 cubic feet each and a service pressure of 5000 psi. The flasks feature double-valve protection and are used to store the HP breathing quality air that has been compressed and filtered by the HPBAC for ultimate delivery to the SCBAs.

**3.2.4.1 Flask Relief Valve.** The relief valve (AHP-V108) for the ship's air storage flask is set to relieve at approximately 5500 psi to prevent overpressurization of the flask.

**3.2.4.2 Flask Drain Valves.** Each ship's air storage flask is equipped with double-valve protection in the event that one malfunctions. The first in-line drain valve closest to the flask (HPBA V5) is normally closed, and the second valve (HPBA V6) near the end of the drain line is locked closed; both valves are usually only opened to drain the flask when maintenance is required.

**3.2.4.3 Flask Isolation Valve.** This valve (HPBA V3) controls air flow to the air storage flasks. This valve is normally locked in the open position.

**3.2.5 SUPPORT EQUIPMENT.** The support equipment for the SCBA HP BACS includes the Filtered Air Supply Hose Assembly (H-103) and the SCBA Quick-Charge Hose Assembly (Scott® Charging Wand), which are illustrated in Figure 3-1 and described in the following paragraphs.

**3.2.5.1 Filtered Air Supply Hose Assembly (H-103).** This hose assembly connects to the charging hose adapter on the SCBA Charging Panel Assembly using a CGA 347 nipple with hand-tight nut. The hose assembly consists of two branches, each containing an isolation valve that features a shutoff knob and a bleed handle. The shutoff knob is used to control the flow of air to the SCBA cylinders and the bleed handle is used to bleed the air between the cylinder and H-103 after charging to enable the cylinder to be safely detached. The design of this hose assembly allows several charging configurations, which include: (1) one or two SCBA cylinders, (2) one or two SCBA quick-charge hose assemblies, or (3) one SCBA cylinder and one SCBA quick-charge hose assembly.

**3.2.5.2 SCBA Quick-Charge Hose Assembly.** Two of the three charging configurations described in paragraph 3.2.4.1 allow the use of one or two SCBA quick-charge hose assemblies to facilitate charging of SCBAs using the quick-fill charging procedure described in Table 2-1. One end of each quick-charge hose assembly is connected to Filtered Air Supply Hose Assembly (H-103) and the other end, which contains a quick-connect fitting, is attached to the SCBA. When the SCBA cylinder pressure reaches 4500 psig, the quick-charge hose assembly is disconnected and can be quickly attached to the next SCBA to be charged. An example of an authorized quick-charge hose assembly is the Scott® Charging Wand that is featured in this manual.

### **3.3 SYSTEM FLOW ANALYSIS.**

A simplified functional diagram that illustrates flow of air through the HPBAC is shown in Figure 3-12 and is used to supplement the following paragraphs. Relative positions of the compressor's four stages are shown in Figure 3-5. The pressure ranges for each stage are shown in Table 3-3, along with the oil pressure range.

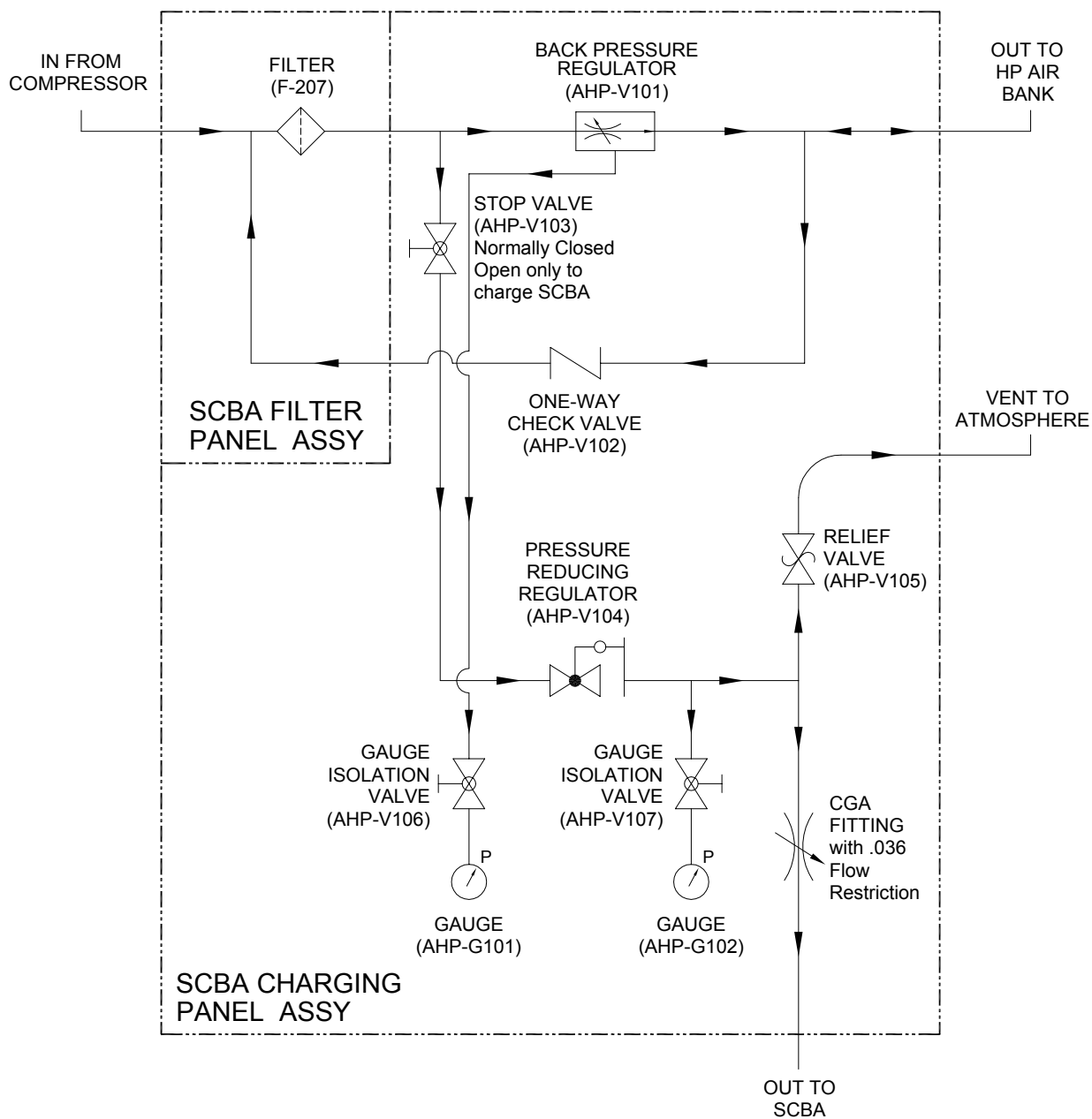
- a. Ambient air is drawn into air intake filter (3, Figure 3-5) by the compressor's 1st stage.
- b. Compressed air from the 1st stage passes through an intercooler (14) and safety valve (9) before reaching the 2nd stage.
- c. Compressed air from the 2nd stage passes through another intercooler (14), safety valve (10), and interstage filter (4) to the 3rd stage.
- d. Compressed air from the 3rd stage flows through a third intercooler (14), safety valve (11), and interstage filter (8) to the 4th stage.

- e. Air from the 4th stage flows through an aftercooler into a coalescing oil and water separator (Figure 3-7) and check valve (3, Figure 3-5) in the HPBAC Air Purification System.
- f. After passing through the dryer and purification chambers (5, 6 Figure 3-8), the air moves through a second check valve (4) that prevents air from back-flowing into the Air Purification System. The air from the check valve then passes into a pressure maintaining valve (9) that ensures air pressure reaches  $2175 \pm 200$  psi before it enters the SCBA Filter Panel Assembly and then passes on to the SCBA Charging Panel Assembly.
- g. The compressed air then flows to the SCBA Charging Panel Assembly and the bank of Ship's Air Storage Flasks for use in charging SCBA bottles.

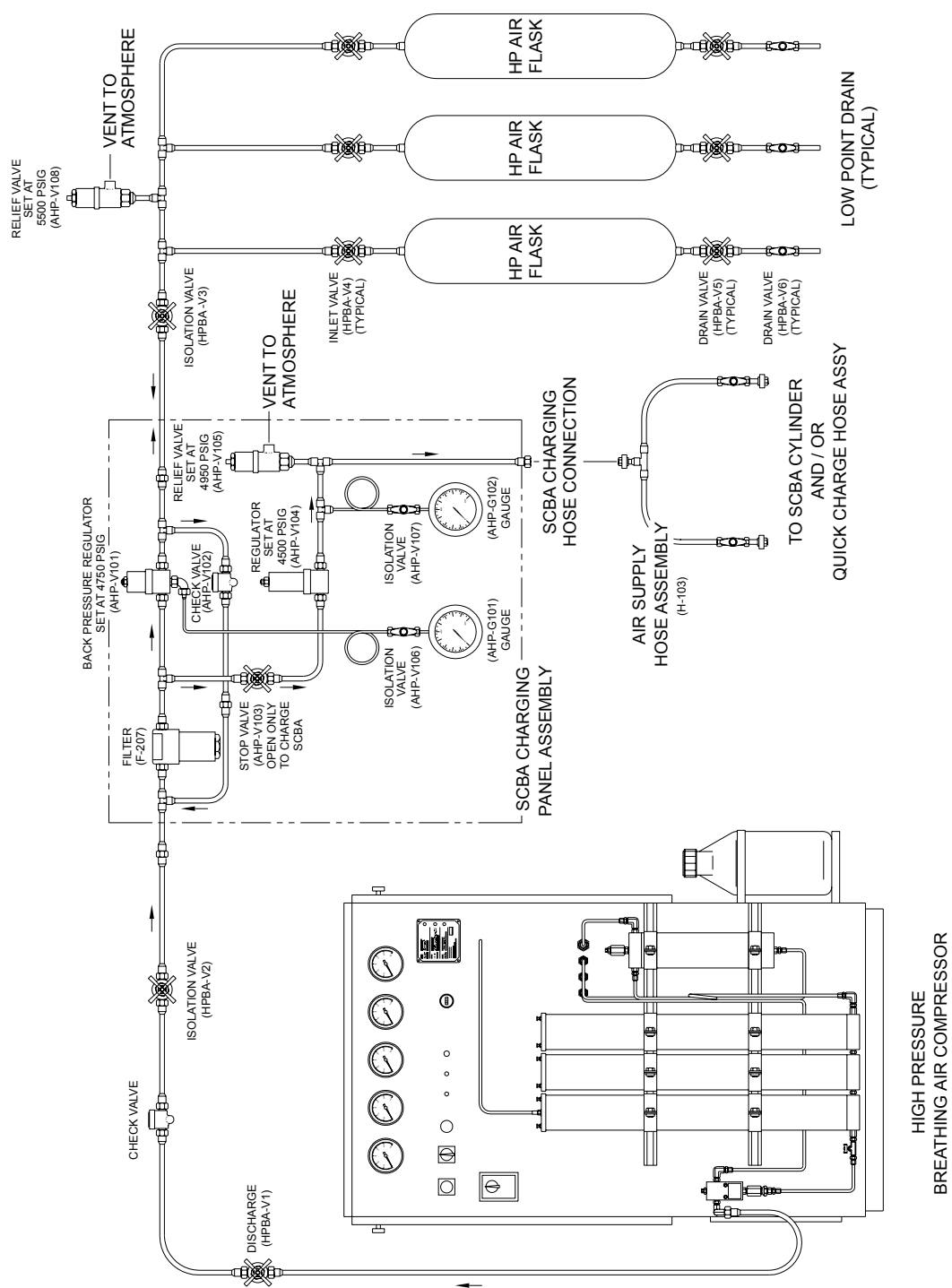
**Table 3-3. Pressure Ranges**

Stage	Pressure Range (psi)	Maximum Pressure
1st	50 to 60	60
2nd	230 to 275	275
3rd	1050 to 1200	1200
4th	4400 to 5100	5100
Oil*	800 to 920	920

\* Manually adjustable (see paragraph 6.3.8.3.2)



**Figure 3-11. SCBA Filter Panel and Charging Panel Functional Flow Diagram**



SCBA HP BACS DIAGRAMMATIC

Figure 3-12. SCBA HP BACS Functional Diagram

## CHAPTER 4

### SCHEDULED MAINTENANCE

#### 4.1 INTRODUCTION.

This chapter identifies maintenance actions that must be accomplished to ensure optimum performance of the Self-Contained Breathing Apparatus High Pressure Breathing Air Charging System (SCBA HP BACS) for LPD-4 Class Ships. These requirements are scheduled according to the service life of the designated system or component.

#### NOTE

Organizational-level scheduled maintenance procedures are provided in the Planned Maintenance System (PMS) for the SCBA HP BACS for LPD-4 Class Ships; refer to Maintenance Index Page (MIP) 5519/025.

#### 4.2 SCOPE.

This chapter contains information necessary for supervisors and personnel to plan, schedule, and document maintenance efficiently. The contents include:

- Paragraph 4.3 — Scheduled Maintenance Requirements
- Paragraph 4.4 — Personnel Requirements
- Paragraph 4.5 — General Maintenance Instructions
- Paragraph 4.6 — Failure Analysis Reporting

#### 4.3 SCHEDULED MAINTENANCE REQUIREMENTS.

All scheduled maintenance procedures for the SCBA HP BACS are included in the PMS for the equipment. Specific procedures are listed on the equipment Maintenance Requirement Cards (MRCs) and are indexed in the associated MIP. Table 4-1 lists scheduled maintenance tasks for this equipment as outlined in the MIP. Since periodicities may change without notice, MRC codes have also been provided to facilitate location of the desired MRC. In the event of conflict between the information contained in this technical manual and that in the MIP/MRCs, the MIP/MRCs take precedence.

#### 4.4 PERSONNEL REQUIREMENTS.

Scheduled maintenance for the SCBA HP BACS shall be performed only by qualified maintenance personnel as indicated in the RATES column of the MIP and associated MRCs for the system.

**Table 4-1. SCBA HP BACS/LPD-4 Scheduled Maintenance**

<b>Periodicity</b>	<b>MRC Code</b>	<b>Maintenance Action</b>
W-1R	E1RC	1. Check in-line filter.
M-1	C9VS	1. Operate and inspect compressor.
Q-1	C5DU	1. Analyze charging system air quality.
Q-2R	C9FE	1. Clean and inspect intake filter element.
A-1	N/A	1. Inspect Teflon, thermoplastic, and metal hoses, end fittings, and supports.
A-2R	E1SQ	1. Inspect compressor drive belts and sheaves. 2. Inspect oil pump drive belts and sheaves.
A-5R	C9FJ	1. Renew compressor lube oil.
A-6R	E1SR	1. Clean and inspect coalescing oil and water separator element. 2. Clean and inspect 2nd and 3rd stage intermediate filter elements.
A-7	E1SS	1. Replace air intake filter element. 2. Renew compressor purifier element. 3. Renew compressor dryer elements.
18M-1	E1ST	1. Test back pressure regulator.
18M-2	E1SU	1. Test air reducing regulator high pressure seat.
24M-1	C9FN	1. Clean and inspect compressor motor controller.
24M-2	E1SV	1. Remove gauge(s) and deliver to IMA for calibration. 2. Install calibrated pressure gauge(s) and test for leaks.
36M-1	E1SW	1. Remove relief valve(s) and deliver to IMA for testing. 2. Install relief valve(s) and test for leaks.
36M-2	E1SX	1. Clean in-line filter.
60M-1	E1SY	1. Remove regulator and deliver to manufacturer for rebuild. 2. Replace regulator and test for leaks.
60M-2	N/A	1. Remove and replace inlet and discharge valves. 2. Remove and replace piston and piston rings.
<b>INACTIVE EQUIPMENT MAINTENANCE</b>		
<b>Lay-Up Maintenance</b>		
LU-1	C9FP	1. Install controller drying agent and protective covering.
LU-2	N/A	1. Install protective covering on compressor air inlet filter/silencer.
<b>Periodic Maintenance</b>		
PM-1	N/A	1. Rotate electric motor shaft 3-1/4 turns every 30 days.
<b>Start-Up Maintenance</b>		
SU-1	N/A	1. Remove controller protective covering and drying agent.
SU-2	N/A	1. Remove protective covering on compressor air inlet filter/silencer.
SU-3	N/A	1. Analyze charging system air quality.
SU-4	N/A	1. Inspect Teflon, thermoplastic, and metal hoses, end fittings, and supports.

## 4.5 GENERAL MAINTENANCE INSTRUCTIONS.

<b>WARNING</b>
----------------

Do not loosen or tighten fittings while system is under pressure. Failure to comply could result in death or injury to personnel and damage to equipment.

Since High Pressure (HP) compressed air may be relieved in one stage and still be contained in another, ensure that all stages are vented. The sudden release of energy from HP air can create airborne particles that may enter eyes or penetrate skin.

Hazardous voltage can cause severe injury or death. Disconnect all power to the HPBAC and tag out equipment before servicing.

High surface temperatures of the compressor and drive motor can cause burns. Allow the unit to cool before servicing.

Before opening bleed valves, ensure all personnel stand clear of area to avoid injury from flying debris. Operator shall announce *Bleeding down* to warn nearby personnel. Operator must wear protective eyewear and hearing protection to prevent personal injury.

**4.5.1 DISASSEMBLY AND REPLACEMENT OF PARTS.** Disassemble equipment only as necessary for each maintenance procedure. Ensure proper tag-out procedures are performed prior to conducting maintenance. Review the complete task procedure before starting. Have all materials and tools readily available before beginning maintenance.

**4.5.2 CLEAN WORKING ENVIRONMENT.** Ensure area surrounding system is free of oil, grease, rust, and other contamination before performing maintenance. Use only cleaning solutions that are authorized for this system. Refer to general cleaning guidelines in paragraph 4.5.9.

**4.5.3 OPENINGS.** To maintain cleanliness of the system, plug or cap open tube ends and equipment ports prior to maintenance.

**4.5.4 REPAIR OR REPLACEMENT.** Replace all parts that do not meet inspection requirements or for which repair procedures are not authorized. Torque loose and leaking fittings and couplings, and repair sheet-metal damage if reasonable to do so.

**4.5.4.1 Repair of Threaded Parts.** Replace any threaded part where damage exceeds more than 50% of any one thread. If damage to the thread is 50% or less, repair (chase) the threads with the appropriate size tap or die. Do not repair damaged threads on any screws, nuts, or other common fasteners; replace if damaged.



**4.5.4.2 Replacement Parts.** Use only approved SCBA HP BACS replacement components. Illustrated parts lists showing approved replacement parts are provided in Chapter 7.

**4.5.5 ANTISEIZE TAPE.** The use of MIL-T-27730 antiseize tape is required for all pipe thread taping applications. Apply tape as follows:

- a. Thoroughly clean male and female threads, assuring removal of all previously applied antiseize tape. Do not allow tape particles to enter lines or valves during disassembly of any taped fittings.
- b. Using care not to contaminate tape, begin with second or third thread and wrap tape in direction of spiral of male pipe thread, encircling the threads twice. Ensure antiseize tape is applied to pipe threads only.
- c. When taping is complete, apply a light coat of MIL-S-8660 silicone compound over tape.

**4.5.6 LUBRICANTS.** Use MIL-S-8660 silicone compound as the lubricant for this system. Apply lubricant sparingly.

**4.5.7 O-RINGS.** Unless otherwise directed, cut and discard all removed O-rings. Inspect exposed O-rings that are not required to be removed; remove and replace if damage is noted.

<b>CAUTION</b>
----------------

**To avoid damage to O-ring groove, remove O-rings using fingers or O-ring installation/removal tool only.**

**4.5.7.1 Removal.** If an O-ring cannot be removed with fingers, use an O-ring installation/removal tool. Scratching the O-ring groove may cause leakage or premature seal failure.

**4.5.7.2 Installation.** Strict cleanliness and proper lubrication are essential during O-ring installation. Ensure new O-rings are of the proper size and material. To ensure correct installation, observe the following:

- a. Ensure parts are clean throughout the assembly procedure. Dirt, chips, or foreign particles in O-ring grooves can cause leakage or damage to O-rings.
- b. Lubricate O-rings before assembly using only approved lubricant for O-rings. Apply lubricant sparingly as excessive lubricant can foul downstream filters and other components.

- c. Ensure O-rings are not twisted in groove; twisting occurs easily during installation of large O-rings with relatively small cross-sectional diameters.
- d. Do not force O-rings over corners, threads, splines, ports, or other sharp edges. Use thimble, support, cone, or other device to prevent O-rings from contacting sharp edges of parts.
- e. When assembling components, apply closing force to produce straight longitudinal movement. Rotating or twisting movements should be avoided to prevent bunching, cutting, or tearing of seals.

#### 4.5.8 **TORQUE GUIDELINES.**

**4.5.8.1 Torque Values.** When torque values are not given in a procedure, refer to Table 4-2 for torque guidelines. When torque values are not given for specific nuts, bolts, or screws in the procedural text, they are not considered to be critical and the values provided in Table 4-2 may be used as a guide for tightening these items. Torque all nuts, bolts, or screws equally for any given application. When a self-locking nut or bolt is being tightened, determine the Prevailing Torque (PT) of the item and add the recommended torque to that value (see paragraph 4.5.8.2).

**4.5.8.2 Prevailing Torque.** Prevailing Torque (PT) is the torque that is necessary to turn a fully engaged fastener before it bottoms out.

- a. Determine PT by using a direct reading torque wrench.
- b. Add PT to the torque given.
- c. Torque fastener(s) to the value obtained in Step b.

**Table 4-2. Standard Torque Table**

Thread (Nut, Bolt, Screw)	Recommended Torque Range (Based on SAE Grade 5)	
	Threads Dry	Threads Coated*
6-32	9-10 in-lb	7-9 in-lb
10-32	29-33 in-lb	22-24 in-lb
1/4-20	63-69 in-lb	47-51 in-lb
5/16-18	120-144 in-lb	102-122 in-lb
3/8-16	23-26 ft-lb	20-23 ft-lb
7/16-14	35-40 ft-lb	30-35 ft-lb
1/2-13	54-63 ft-lb	47-55 ft-lb
5/8-11	109-127 ft-lb	95-110 ft-lb

\* Coated with zinc chromate or locking compound

#### 4.5.9 CLEANING.

<b>WARNING</b>
----------------

Ensure that the area is well ventilated when using cleaning solvents. Avoid breathing of fumes and do not allow solvents to contact skin or eyes. Keep flame and other sources of ignition away from solvent and solvent vapors.

Do not use solvents in a Collective Protection System (CPS) space. Use of flammable or volatile substances may displace oxygen and cause fire or death.

<b>CAUTION</b>
----------------

Do not soak electrical components in solvent as excessive solvent can damage insulation and compromise bonding agents. Instead, use a clean lint-free cloth lightly moistened with solvent.

#### **NOTE**

Moisture from the atmosphere and accumulated dust can be corrosive to many surfaces. Keep the SCBA HP BACS clean by occasionally blowing finned cooling surfaces and other exposed areas with low-pressure compressed air (not more than 15 psig) and/or by wiping with a clean dry cloth. Ensure motor is similarly cleaned and vent openings are kept clear.

After cleaning, parts shall be free of rust, corrosion, dirt, grease, oil, and other contaminants.

**4.5.9.1 General Cleaning Practices.** Clean all hardware (screws, nuts, washers, machine keys, etc.) before use. Existing hardware and related parts may be reused unless otherwise directed or if an item is defective.

**4.5.9.2 Component Cleaning.** When disassembled metal parts are found to be caked with oil residue and dirt, clean with solvent and a bristle or nylon brush, as appropriate. Metal-encapsulated electrical units (e.g., pressure switches) may be wiped clean with a clean cloth moistened with general-purpose detergent.

**4.5.9.3 Drying and Dry Cleaning.** Dry and/or dry-clean parts with a clean cloth or use low-pressure compressed air (not more than 15 psig).

**4.5.10 INSPECTION.** All parts should be cleaned before inspection. Ensure all threads are clean and unbroken. Reject threaded parts if any one thread is damaged more than 50%. Check all areas that touch packings, seals, and gaskets for rough surfaces and corrosion that can prevent a good seal or that can damage the packings, gaskets, and seals. Visually check all reusable parts with a strong light for nicks, cracks, breaks, dents, and other obvious signs of damage, corrosion, or wear. Inspect components subject to high pressure with 10X magnification. Inspect tube assemblies for evidence of leaks, dents, or other damage. Ensure plates and labels are legible and are not torn or otherwise damaged.

**4.5.10.1 Leak Detection.** After performing maintenance, the system needs to be checked for leaks before operation. The use of MIL-L-25567D, Type I leak detection compound is recommended for leak testing the SCBA HP BACS. A solution made with MIL-D-16791, Type I Nonionic Detergent (NID) may also be used for leak testing if necessary. NID solution is prepared by mixing one teaspoon of nonionic detergent with one gallon of warm, fresh water.

**4.5.10.2 Correcting Leaks.** Tighten leaking tube connections as little as necessary to stop leaks. If more than 1/2 turn is required, replace tube assembly.

**4.5.11 CHECKOUT.** When assembly is complete, check for cleanliness and workmanship, and check fittings and fasteners to be sure all are properly tightened. Look for evidence of leaks. Carefully run the pre-operating checklist, then start the compressor and pay particular attention to readings for proper operating parameters. Check again for evidence of leaks or other anomalies while the compressor is running.

## **4.6 FAILURE ANALYSIS REPORTING.**

**4.6.1 Record Keeping.** Good record keeping is essential to the maintenance of components that must be serviced or replaced according to hourmeter readings. See Figure 2-6 for a sample operating log.

**4.6.2 Reporting Failures.** Provide failure analysis reporting in accordance with the U.S. Navy 3M Program, OPNAVINST 4790/82.

**THIS PAGE INTENTIONALLY LEFT BLANK**

## CHAPTER 5

### TROUBLESHOOTING

#### 5.1 INTRODUCTION.

This chapter provides troubleshooting procedures for the Self-Contained Breathing Apparatus High Pressure Breathing Air Charging System (SCBA HP BACS) for LPD-4 Class Ships. Isolation of problems encountered should normally proceed from the general to the specific, beginning with determination of the area in which the particular fault occurs. The next step in the isolation process is to determine the specific part suspected of being faulty. When such isolation procedures are followed logically and correctly through a step-by-step pattern of check and elimination, the fault can usually be traced to its source without unnecessary delay or replacement of parts. Well-kept operating and maintenance logs are the best possible supplement to the troubleshooting chart presented in this chapter (see Figure 2-6 for a sample operating log).

#### NOTE

Damaged electrical connections are considered to be failures of the associated electrical component or wiring. Prior to replacing suspect electrical components, perform a continuity, resistance, or voltage check (as applicable) using a multimeter and applicable contact points to determine the condition of the electrical component.

#### 5.2 TROUBLESHOOTING CHART.

Table 5-1 contains a troubleshooting chart that lists the possible symptoms that might be encountered by a maintenance technician when troubleshooting components of the High Pressure Breathing Air Compressor (HPBAC) and the Self-Contained Breathing Apparatus (SCBA) Charging Panel Assembly. The table is divided into sections by assemblies/subassemblies, and each section is further divided into symptoms, probable causes and remedies. The *Probable Cause* column in Table 5-1 provides a logical troubleshooting sequence to be followed to isolate a fault. If the first probable cause fault isolation procedure and remedy do not correct the trouble, proceed to the next probable cause. Continue down the columns until the appropriate remedy corrects the trouble.

#### 5.3 SCHEMATIC DIAGRAMS.

A Pneumatic Schematic Diagram (Figure 5-1), Ladder Diagram (Figure 5-2), and Electrical Wiring Diagram (Figure 5-3) have been provided at the end of this chapter to provide further assistance in troubleshooting and fault isolation efforts. The functional diagrams in Figures 3-11 and 3-12 may also be of benefit as they present a comprehensive overview of the whole system with control and indicator connections and air, oil, and condensate flow paths.

**Table 5-1. Troubleshooting Chart**

Symptom	Probable Cause	Remedy
<b>HPBAC -- Drive Motor</b>		
1. Direction of rotation does not agree with arrow on HPBAC.	Power source out of phase.	Interchange two of three-phase leads in switch box or control panel (NEVER switch leads at motor).
2. Motor hums but does not run.	a. One phase is missing.	Check phase voltage; correct as necessary.
	b. Defective motor.	Disconnect drive V-belts IAW paragraph 6.3.2. If compressor flywheel turns freely, replace motor IAW paragraph 6.3.9.
	c. Defective compressor block.	Disconnect drive V-belts IAW paragraph 6.3.2. If compressor flywheel does not turn freely, contact manufacturer or IMA for replacement of failed component.
	d. Seized bearings.	Check for seized bearings by rotating the motor. Replace motor as required IAW paragraph 6.3.9.
3. Motor does not run.	a. Thermal overload relay tripped.	Perform continuity check; correct as necessary. Press Motor Reset pushbutton switch and start HPBAC using Power ON/OFF selector switch.
	b. Fault in controller assembly wiring.	Check controller assembly for loose connections; correct as necessary.
	c. Defective motor contactor.	Perform continuity check. Replace contactor as necessary IAW paragraph 6.3.3.1.
4. Motor functions improperly.	a. Drive motor pulley not aligned with compressor flywheel.	Align drive motor pulley with compressor flywheel IAW 6.3.9.d.
	b. Compressor flywheel not turning freely.	Disconnect drive V-belts IAW paragraph 6.3.2. If compressor flywheel does not turn freely, contact manufacturer or IMA for replacement of failed component.
<b>HPBAC -- Compressor Block Assembly</b>		
1. 1 <sup>st</sup> , 2 <sup>nd</sup> , or 3 <sup>rd</sup> stage air discharge pressure exceeds redline value.	a. Gauge out of calibration.	Check calibration sticker. If not valid, remove gauge IAW paragraph 6.3.4.1.1 and replace with gauge that has valid calibration date. Send defective gauge for calibration.
	b. Defective discharge valve (same stage) or inlet valve (next stage).	Contact manufacturer or IMA for replacement of failed component.

**Table 5-1. Troubleshooting Chart - Continued.**

Symptom	Probable Cause	Remedy
<b>HPBAC -- Compressor Block Assembly - Continued.</b>		
2. 4 <sup>th</sup> stage air discharge pressure exceeds redline value.	a. Gauge out of calibration.	Check calibration sticker. If not valid, remove gauge IAW paragraph 6.3.4.1.1 and replace with gauge that has valid calibration date. Send defective gauge for calibration.
	b. Defective air pressure cutout switch PS1.	Check PS1 for continuity IAW Table 6-5 (Continuity Check). If defective, replace IAW paragraph 6.3.8.2.
	c. Air pressure cutout switch PS1 improperly set.	Adjust PS1 IAW paragraph 6.3.8.2.1.
3. Oil pressure exceeds redline value.	a. Oil pressure regulator improperly set.	Adjust oil pressure regulator IAW 6.3.8.3.2.
	b. Gauge out of calibration.	Check calibration sticker. If not valid, remove gauge IAW paragraph 6.3.4.1.2 and replace with gauge that has valid calibration date. Send defective gauge for calibration.
4. Low (less than 500 psi) or no oil pressure.	a. Low/no oil in sump.	Check oil level in sight glass. If low, add oil IAW MRC 5519/025 C9FJ. If oil consumption is excessive, refer to Symptom 5.
	b. Oil pressure regulator improperly set.	Adjust oil pressure regulator IAW paragraph 6.3.8.3.2.
	c. Air trapped in lube oil circuit	Vent oil pump and line IAW paragraph 6.3.8.3.3.
	d. Oil pressure gauge out of calibration.	Check calibration sticker. If not valid, remove gauge IAW paragraph 6.3.4.1.2 and replace with gauge that has valid calibration date. Send defective gauge for calibration.
	e. Defective oil pressure switch PS2.	Check PS2 for continuity IAW Table 6-5 (Continuity Check). If defective, replace IAW paragraph 6.3.8.2.
	f. Oil pump drive V-belt failure.	Check belt tension and sheave wear. Adjust or replace drive V-belt IAW paragraph 6.3.2.2.
	g. Oil pump failure.	Contact manufacturer or IMA for replacement of failed component.
5. Excessive oil consumption.	a. Leaky tube fittings.	Tighten tube fittings or replace tube assembly.
	b. Faulty interstage oil separator return.	Replace oil separator.
	c. Worn cylinders, rings. or pistons.	Contact manufacturer or IMA for replacement of failed component.
	d. Leaking camshaft seal or pistons.	Contact manufacturer or IMA for replacement of failed component.



**Table 5-1. Troubleshooting Chart - Continued.**

Symptom	Probable Cause	Remedy
<b>HPBAC -- Compressor Block Assembly - Continued.</b>		
6. Oil in sight glass contains bubbles.	a. Air trapped in lube oil circuit.	Vent oil pump and line IAW paragraph 6.3.8.3.3.
	b. Oil pressure regulator improperly set.	Adjust oil pressure regulator IAW paragraph 6.3.8.3.2.
7. Oil in sight glass contains foam.	a. Oil level too high.	Check oil level in sight glass. If too high, drain oil to proper level using MRC 5519/025 C9FJ.
	b. 4th stage piston or discharge valve worn or defective.	Contact manufacturer or IMA for replacement of failed component.
8. Oil residue in delivered air.	a. Improper maintenance of filters or filter element saturated	Clean and inspect interstage filters and oil and water separator IAW MIP 5519/025 and MRC E1SR. Renew dryer and purifier chamber elements IAW MRC 5519/025 E1SS.
	b. High oil level or wrong oil type.	Drain oil level to proper level or replace with correct oil IAW MRC 5519/025 C9FJ. Inspect valves; clean any coking.
	c. Faulty interstage oil separator return.	Replace oil separator.
	d. Worn piston rings and/or cylinders.	Contact manufacturer or IMA for replacement of failed component.
9. Compressor does not attain final pressure and operates irregularly.	a. Air pressure cutout switch PS1 improperly set.	Adjust PS1 IAW paragraph 6.3.8.2.1.
	b. Drive V-belts worn or slipping.	Replace or tighten V-belts IAW paragraph 6.3.2.1.
	c. Drive motor pulley not aligned with compressor wheel.	Align motor pulley with compressor flywheel IAW paragraph 6.3.8.1.
	d. Worn piston or piston rings.	Contact manufacturer or IMA for replacement of failed component.
10. Compressor does not attain final pressure but operates normally.	a. Clogged air intake filter.	Clean filter element IAW MRC 5519/025 C9FE.
	b. Air pressure leak in system.	Check for leaks in system and repair as necessary.
	c. Premature opening of relief valve(s).	Spray relief valves(s) with leak detection solution and observe applicable pressure gauge to see at what pressure valve(s) open(s); compare with setting in Table 1-2. If valve(s) is/are defective, replace IAW paragraph 6.4.6.

**Table 5-1. Troubleshooting Chart - Continued.**

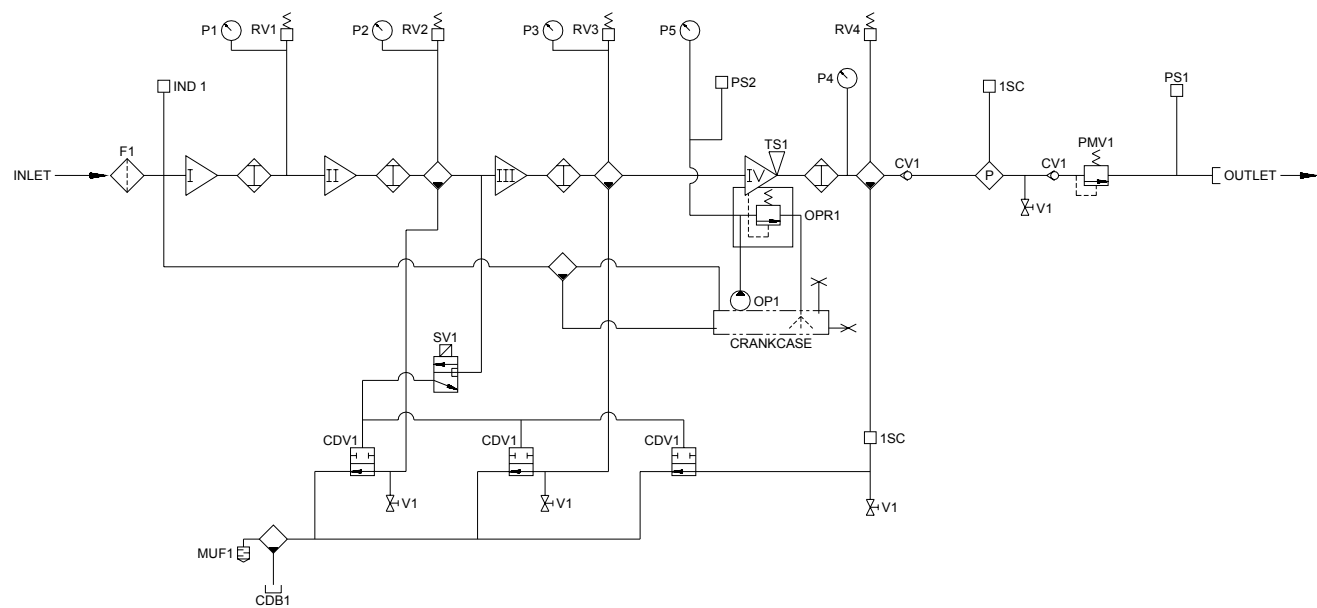
Symptom	Probable Cause	Remedy
<b>HPBAC -- Compressor Block Assembly - Continued.</b>		
10. Compressor does not attain final pressure but operates normally – Continued.	d. Clogged oil and water separator.	Clean separator element IAW MRC 5519/025 E1SR.
	e. Pressure relief valve(s) between stages releasing pressure.	See Symptom 11.
	f. Pressure Maintaining Valve (PMV) set too high.	Adjust PMV IAW paragraph 6.3.7.2.h.
	g. Automatic Condensate Drain (ACD) valves not working properly.	Check operation of valves IAW remedy (1) in ACD valve assembly section. If valve is defective, replace ACD valve assembly IAW paragraph 6.3.5.
	h. Defective intake or discharge valve not closing.	Contact manufacturer or IMA for replacement of failed component.
11. Pressure relief valve(s) between stages releasing pressure.	a. Improperly set or defective relief valve.	Replace valve IAW MRC 5519/025 E1SW.
	b. Relief valve not closing properly.	Replace valve IAW MRC 5519/025 E1SW.
	c. Intermediate pressure too high.	Replace valve IAW MRC 5519/025 E1SW.
12. Compressor shuts down prior to reaching 5000 ± 100 psi.	Air pressure cutout switch PS1 out of adjustment.	Adjust PS1 to proper pressure setting IAW paragraph 6.3.8.2.1.
13. Final (4 <sup>th</sup> stage) relief valve vents.	a. Air pressure cutout switch PS1 out of adjustment.	Adjust PS1 to proper pressure setting IAW paragraph 6.3.8.2.1.
	b. Blocked check valve.	Replace check valve IAW paragraph 6.4.3.
	c. Pressure Maintaining Valve (PMV) improperly set.	Adjust PMV to proper pressure IAW paragraph 6.3.7.2.h.
14. Outlet flow restriction.	a. Clogged in-line filter element in SCBA Charging Panel Assembly.	Clean filter element IAW MRC 5519/025 E1SX.
	b. Clogged interstage oil filter and/or water separator.	Clean filter elements IAW MRC 5519/025 E1SR.
	c. Clogged purifier or dryer elements.	Replace purifier or dryer elements IAW MRC 5519/025 E1SS.
15. Pressure Maintaining Valve (PMV) operating at wrong pressure.	a. Incorrect setting.	Adjust PMV to proper setting IAW paragraph 6.3.7.2.h.
	b. Damaged valve seat.	Replace PMV IAW paragraph 6.3.7.2.

**Table 5-1. Troubleshooting Chart - Continued.**

Symptom	Probable Cause	Remedy
HPBAC -- Compressor Block Assembly - Continued.		
16. Compressor running too hot.	a. Insufficient supply of fresh air.	Ensure equipment envelope is not blocked or covered while operating.
	b. Intercoolers clogged.	Remove and clean intercoolers.
	c. Aftercooler dirty.	Clean finned tubes by blowing with low pressure air (15psi).
	d. Flywheel turning in wrong (clockwise) direction.	Observe arrow on flywheel. If flywheel is turning in wrong direction, switch 2 of the 3-phase leads at electrical controller assembly (NEVER switch leads at motor). Repeat until flywheel turns in right direction.
	e. Cooling air fan running but not delivering due to worn or loose V-belts.	Check V-belts. Tension or replace IAW paragraph 6.3.2.1.
	f. Pressure running higher than normal due to inlet and/or discharge valve operating improperly.	Contact manufacturer or IMA for replacement of failed component.
HPBAC -- Automatic Condensate Drain (ACD) Valve		
Automatic Condensate Drain (ACD) valve not opening or closing.	Electronic solenoid valve faulty or not receiving electrical signal.	(1) Allow solenoid valve to cycle, then immediately open manual condensate drain valve. If more than 2 ounces of liquid drains from any drain valve, ACD valve assembly not working properly. Replace ACD IAW para. 6.3.5.
		(2) Check for continuity of ACD solenoid IAW Table 6-5 (Continuity Check). If solenoid has continuity, replace timer. If not, replace solenoid.
HPBAC -- Electrical System		
1. HPBAC does not switch on.	a. No feed line voltage.	Check feed line. Correct as necessary.
	b. Defective fuse.	Replace fuse.
	c. Air pressure switch PS1 set too low.	Correct IAW paragraph 6.3.8.2.1.
	d. Electrical terminals loose or line damaged.	Tighten terminals or repair line.
	e. Air pressure switch PS1 defective	Replace PS1 IAW paragraph 6.3.8.2.
	f. Motor Reset pushbutton switch not reset.	Press Motor Reset pushbutton switch and restart HPBAC using ON pushbutton switch.
	g. Broken wire(s)	Repair or replace.
	h. Corroded terminal connection(s).	Clean or replace.

**Table 5-1. Troubleshooting Chart - Continued.**

Symptom	Probable Cause	Remedy
<b>HPBAC -- Electrical System - Continued.</b>		
1. HPBAC does not switch on - Continued.	i. Master ON/OFF selector switch defective.	Replace switch IAW paragraph 6.3.4.4.
	j. Power ON/OFF selector switch defective.	Replace switch IAW paragraph 6.3.4.3.
	k. Failed transformer.	Replace transformer IAW paragraph 6.3.3.2.
	l. Failed contactor.	Replace contactor IAW paragraph 6.3.3.1.
2. HPBAC does not switch off.	a. Air pressure switch PS1 set too high.	Adjust PS1 IAW paragraph 6.3.8.2.1.
	b. Air pressure switch PS1 defective.	Replace PS1 IAW paragraph 6.3.8.2.
	c. Power ON/OFF selector defective.	Replace switch IAW paragraph 6.3.4.3.
	d. Pressure leak within system.	Locate and repair leak.
<b>SCBA Filter Panel and Charging Panel Assemblies</b>		
1. Charging time greater than 2 minutes or inadequate pressure output.	a. Clogged in-line filter element.	Clean filter element IAW MRC E1SX.
	b. SCBA charging panel regulator out of adjustment.	Adjust regulator IAW paragraph 6.4.5.g.
	c. SCBA charging panel regulator failure.	Replace regulator IAW paragraph 6.4.5.
	d. Faulty compressor valve operation.	Contact manufacturer or IMA for replacement of failed component.
2. Excessive cycling of HPBAC during charging operations.	a. Back pressure regulator (BPR) set too high.	Test BPR IAW MRC 5519/025 E1ST.
	b. Check valve AHP-V102 failed.	Replace AHP-V102 IAW paragraph 6.4.3.
	c. AHP-V102 installed incorrectly.	Check orientation of AHP-V102 and reinstall IAW paragraph 6.4.3.



LEGEND	
ITEM	DESCRIPTION
V1	DRAIN/BLEED VALVE
TS1	TEMPERATURE SWITCH
SV1	A.C.D. SOLENOID VALVE
RV4	FOURTH STAGE RELIEF VALVE
RV3	THIRD STAGE RELIEF VALVE
RV2	SECOND STAGE RELIEF VALVE
RV1	FIRST STAGE RELIEF VALVE
PS1	AIR PRESSURE SWITCH (CUT-IN) AND (CUT-OUT)
PS2	OIL PRESSURE SWITCH
PMV1	PRESSURE MAINTAINING VALVE
P5	OIL PRESSURE GAUGE
P4	FOURTH STAGE PRESSURE GAUGE
P3	THIRD STAGE PRESSURE GAUGE
P2	SECOND STAGE PRESSURE GAUGE
P1	FIRST STAGE PRESSURE GAUGE
OR1	ORIFICE FITTING
OPR1	OIL PRESSURE REGULATOR
OP1	OIL PUMP
MUF1	EXHAUST MUFFLER
F1	INTAKE FILTER
IND1	INLET FILTER MAINTENANCE INDICATOR
1SC	MOISTURE MONITOR
CV1	CHECK VALVE
CDV1	CONDENSATE DRAIN VALVE
CDB1	CONDENSATE DRAIN BOTTLE
	PURIFICATION
	CONDENSATE SEPARATOR
	INTER/AFTER STAGE COOLER
	COMPRESSOR

Figure 5-1. Pneumatic Schematic Diagram

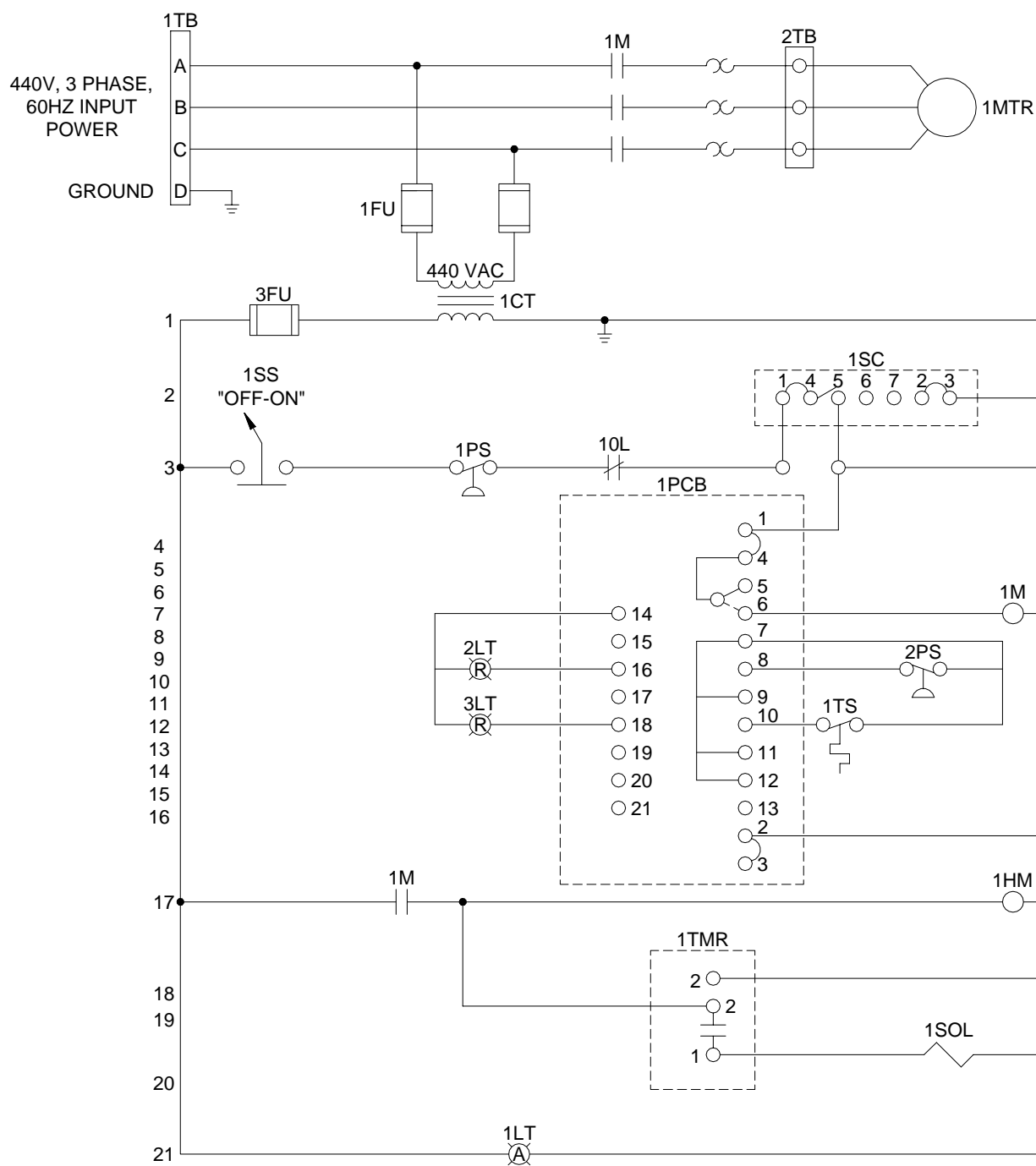


Figure 5-2. Ladder Diagram

**THIS PAGE INTENTIONALLY LEFT BLANK**

- NOTES:
- 1. WIRING DIAGRAM FOR K966037-1 ASSY. MODIFY WIRING OF BAUER (CAGE CODE 57328) MODEL VT26-E3 AS SHOWN HEREON.
  - 2. SEE DWG K300270 FOR LEGENDS.
  - 3. SEE DWG K845249 FOR PARTS LIST OF REMOTE CONTROLLER (2PCB).
  - ④ INSTALL INDICATED ITEM PER MFR'S INSTRUCTIONS.
  - 5. UNLESS OTHERWISE NOTED WIRES, TO BE ADDED BY HAI SHALL BE #18 AWG.
  - ⑥ INDICATED WIRES TO BE SUPPLIED BY CUSTOMER.
  - ⑦ REUSE INDICATED WIRES AS FOLLOWS. REMOVE THE END CONNECTED TO 1TB-3 AND CONNECT TO 2PCB-4.
  - ⑧ REUSE INDICATED WIRE AS FOLLOWS. REMOVE THE END CONNECTED TO 1SS-4 AND CONNECT TO 21PB-3.

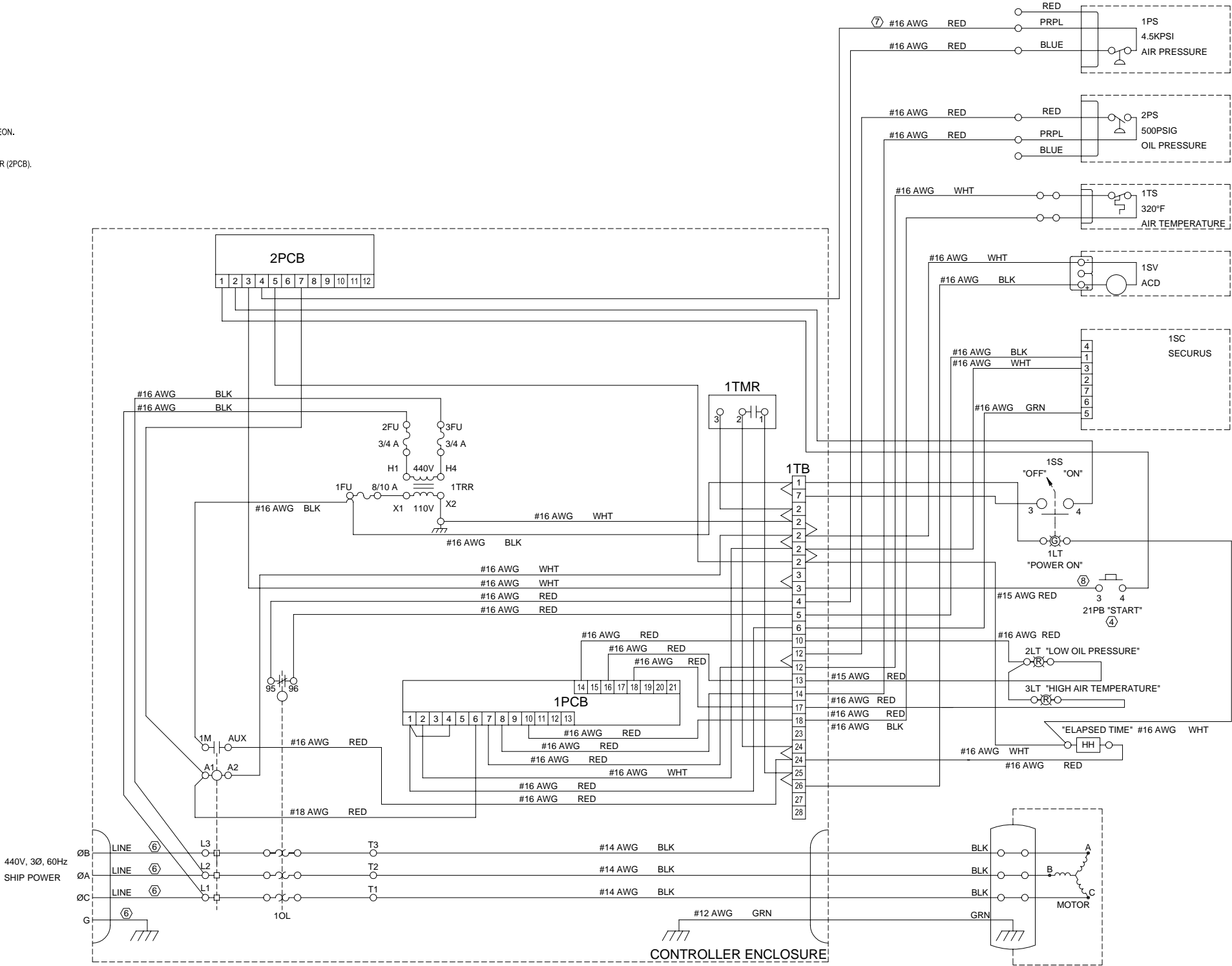


Figure 5-3. Electrical Wiring Diagram



**THIS PAGE INTENTIONALLY LEFT BLANK**

## CHAPTER 6

### CORRECTIVE MAINTENANCE

#### 6.1 INTRODUCTION.

**6.1.1 PURPOSE AND SCOPE.** This chapter provides detailed procedures for authorized corrective maintenance of the Self-Contained Breathing Apparatus High Pressure Breathing Air Charging System (SCBA HP BACS) for LPD-4 Class Ships. Maintenance personnel are reminded that disassembly should be performed only to the degree necessary to repair known or suspected deficiencies as revealed by qualified equipment operators, the scheduled maintenance instructions in Chapter 4, or the troubleshooting procedures in Chapter 5.

**6.1.2 REPAIR TOOLS, MATERIALS, AND TEST EQUIPMENT.** Table 6-1 provides a summary of repair tools and test equipment required to perform adjustments, repairs, and alignments to the SCBA HP BACS. Table 6-2 provides a list of consumable materials required for corrective maintenance of the system.

#### 6.2 REPAIR.

**6.2.1 GENERAL MAINTENANCE INSTRUCTIONS.** Refer to paragraph 4.5 for a complete listing of general maintenance instructions relating to maintenance of the SCBA HP BACS. Be sure to tag out equipment In Accordance With (IAW) shipboard instructions before performing maintenance.

**6.2.2 COMPONENTS TO BE REPAIRED.** Detailed disassembly and assembly instructions are given for the High Pressure Breathing Air Compressor (HPBAC) (paragraph 6.3), the Self-Contained Breathing Apparatus (SCBA) Filter Panel Assembly and SCBA Charging Panel Assembly (paragraph 6.4), and their subcomponents (see maintenance chart in Table 6-3 for a complete listing of components and reference information). Disassembly should be undertaken only to the degree necessary to repair the defective parts or system in question. Except for making adjustments that must be made while the compressor is running, ensure the Master ON/OFF selector switch is OFF and that all other controls are in OFF or SHUTDOWN (neutral) position before repair is begun. Disconnect and lock out main power to the compressor before attempting disassembly.

**6.2.3 TUBE ASSEMBLIES.** Tube assemblies are not to be disassembled. If replacement is required, replace as an assembly.

**6.2.4 FUNCTIONAL TEST.** After repairing or replacing components, perform a functional test as outlined in Table 6-4 to ensure the high pressure breathing air compressor meets performance requirements.

**6.2.5 SYSTEM DEPRESSURIZATION AND PRESSURIZATION.** Numbers in parentheses refer to Figure 6-1.

a. System Depressurization.

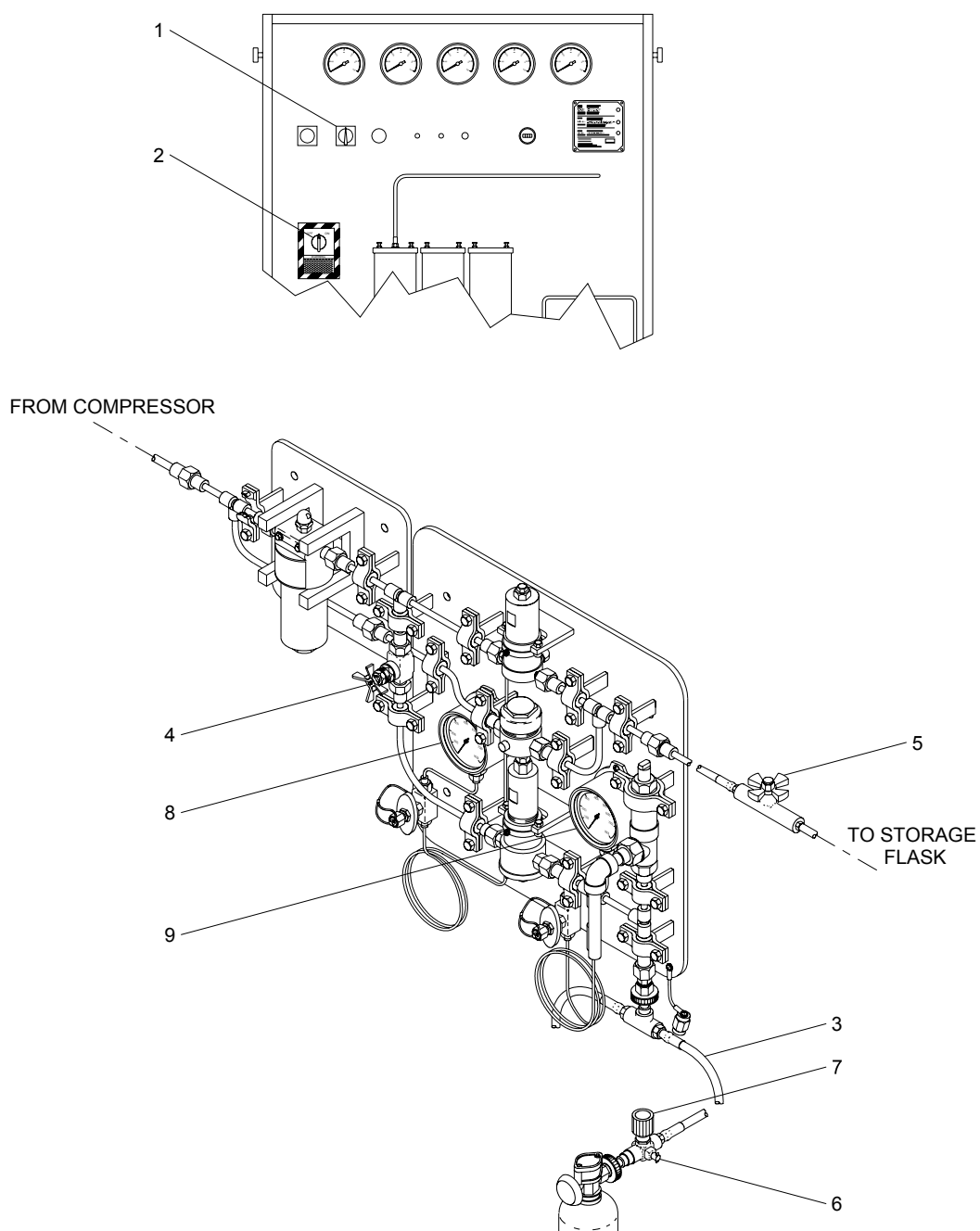
**NOTE**

Ensure system is tagged-out IAW with current shipboard instructions.

- (1) Turn Power ON/OFF switch (1) to OFF position.
- (2) Turn Master ON/OFF switch (2) to OFF position.
- (3) Attach hose AHP-H103 (3) to charging panel SCBA outlet.
- (4) Close stop valve AHP-V103 (4).
- (5) Close isolation valve (5) to storage flasks.
- (6) Ensure bleed valve (6) on hose AHP-H103 (3) is closed.
- (7) Open isolation valve (7) on hose AHP-H103 (3).
- (8) Open bleed valve (6) on hose AHP-H103 (3).
- (9) Observe gauges AHP-G101 (8) and AHP-G102 (9) as they decrease to zero.

b. System Pressurization and Leak Check.

- (1) Ensure hose AHP-H103 (3) is attached.
- (2) Ensure isolation valve (7) on hose AHP-H103 (3) is closed.
- (3) Ensure bleed valve (6) on hose AHP-H103 (3) is closed.
- (4) Open isolation valve (5) to storage flasks.
- (5) Open stop valve AHP-V103 (4).
- (6) Turn Master ON/OFF switch (2) to ON position.
- (7) Turn Power ON/OFF switch (1) to ON position.
- (8) Perform system leak check using leak detection compound, MIL-L-25567D, Type I. If no leaks are detected, remove Out of Service tag.



**Figure 6-1. System Depressurization and Pressurization**

### 6.3 HPBAC REPAIR.

Corrective maintenance of the HPBAC includes instructions for disassembly, cleaning, inspection, repair/replacement, reassembly, and checkout of system components. The HPBAC components that are covered in this section are shown below in the order in which they appear.

- Paragraph 6.3.1 — Access Panels
- Paragraph 6.3.2 — V-Belts
- Paragraph 6.3.3 — Electrical Panel
- Paragraph 6.3.4 — Instrument and Control Panel
- Paragraph 6.3.5 — Automatic Condensate Drain (ACD)
- Paragraph 6.3.6 — Silencer/Separator
- Paragraph 6.3.7 — Air Purification System
- Paragraph 6.3.8 — Compressor Block Assembly
- Paragraph 6.3.9 — Drive Motor/Cable Assembly

**Table 6-1. Tools and Test Equipment**

Item	Description*
<b>Standard Tools</b>	
1	Brush, Nylon
2	Chain Hoist & Slings, 500 lb capacity
3	Flashlight, Type 3, Style 1, Explosive Proof
4	Mallet, Rawhide, 6 oz.
5	Pliers, Diagonal Cutting
6	Pliers, Needle Nose, 6"
7	Pliers, Vice Grip, 7"
8	Screwdriver, Cross Tip, Straight, 6-pc., Phillips
9	Screwdriver Set, Flat Tip, 1/8" to 5/16" tip
10	Sockets, 3/8" Drive Hex Bit
11	Straight Edge, 3'
12	Wheel Puller, 3-Jaw
13	Pipe Wrench, Large, Smooth Jaw
14	Wrench Set, allen, 1/8" to 9/16", 3mm to 10mm
15	Wrench, Combination, 27mm x 30mm
16	Wrench, Combination, 32mm x 30mm
17	Wrench Set, Combination Box and Open End, 11-pc., SAE, 1/4" to 1-3/4"
18	Wrench Set, Combination Box and Open End, 11-pc., SAE, 6mm to 32mm
19	Wrench, Crescent, 6"

**Table 6-1. Tools and Test Equipment - Continued.**

Item	Description*
<b>Standard Tools - Continued.</b>	
20	Wrench, Crescent, 10"
21	Wrench Set, Socket, 1/4" to 1", 3/8", 1/2" drive, with extensions
22	Wrench Set, Socket, 6mm to 32mm drive, with extensions
23	Wrench, Strap
24	Bauer tool, P/N WRH-0005
Item	Description*
<b>Test Equipment</b>	
1	Gauge, Pressure, 0-6,000 psi
2	Multimeter, Digital, with Temperature Measurement
3	Thermometer, to 140 °F

\* Equivalent substitutes may be used for the items listed above.

**Table 6-2. Consumable Materials**

Material	Specification or Part No.	Use
Detergent, general purpose	MIL-D-16791	Cleaning, leak testing
Leak Detection Compound	MIL-L-25567D, Type I	Leak testing
Loctite®	MIL-S-46163A	Thread locker
Oil, Lubricating	MIL-PRF-17331 (2190 TEP) (formerly MIL-L-17331)	Compressor oil
Silicone Compound	MIL-S-8660	Lubricant for O-rings and rubber or plastic parts
Tape, Antiseizing	A-A-58092	Thread wrap for bolts, nuts, studs, tube connections, etc.

**Table 6-3. Maintenance Reference Chart**

Nomenclature	Designation	Assembly	Ch 6 Paragraph	Ch 7 Table
Access Panels	--	HPBAC	6.3.1	7-1
Air Pressure Cut-Out Switch, Adjustment	1PS (Air)	HPBAC	6.3.8.2.1	7-1
Air Pressure Gauges	--	HPBAC	6.3.4.1.1	7-3
Air Purification System	--	HPBAC	6.3.7	7-4
Automatic Condensate Drain (ACD)	--	HPBAC	6.3.5	7-3
Automatic Condensate Drain (ACD) Timer	--	HPBAC	6.3.3.3	7-1
Back Pressure Regulator	AHP-V101	SCBA PANELS	6.4.2	7-6

**Table 6-3. Maintenance Reference Chart - Continued.**

Nomenclature	Designation	Assembly	Ch 6 Paragraph	Ch 7 Table
Belt Guard Panel	--	HPBAC	6.3.1.4	7-1
Coalescing Filter Housing	--	HPBAC	6.3.7.3.1	7-4
Compressor Block	--	HPBAC	6.3.8.1	7-2
Compressor Block Assy	--	HPBAC	6.3.8	7-2
Drive Motor/Cable Assembly	--	HPBAC	6.3.9	7-5
Drive V-Belts	--	HPBAC	6.3.2.1	7-1
Electrical Enclosure Access Panel	--	HPBAC	6.3.1.5	7-1
Electrical Panel	--	HPBAC	6.3.3	7-1
Filter Housings	--	HPBAC	6.3.7.3	7-4
Gauge Isolation Valves	AHP-V106 AHP-V107	SCBA PANELS	6.4.7	7-6
Gauges	--	HPBAC	6.3.4.1	7-3
Gauges	AHP-G101 AHP-G102	SCBA PANELS	6.4.8	7-6
Hourmeter	--	HPBAC	6.3.4.7	7-3
Indicator Lights	--	HPBAC	6.3.4.6	7-3
Inlet Filter Maintenance Indicator	--	HPBAC	6.3.4.5	7-3
Instrument and Control Panel	--	HPBAC	6.3.4	7-1,7-3
Master ON/OFF Selector Switch	--	HPBAC	6.3.4.4	7-3
Oil Pressure Cut-Out Switch, Adjustment	2PS (Oil)	HPBAC	6.3.8.2.2	7-1
Oil Pressure Gauge	--	HPBAC	6.3.4.1.2	7-3
Oil Pressure Regulator	--	HPBAC	6.3.8.3	7-2
Oil Pump Drive V-Belt	--	HPBAC	6.3.2.2	7-2
One-Way Check Valve	AHP-V102	SCBA PANELS	6.4.3	7-6
Overload Relay and Motor Starter	--	HPBAC	6.3.3.1	7-1
Power ON/OFF Selector Switch	--	HPBAC	6.3.4.3	7-3
Pressure Cut-Out Switches	1PS (Air) 2PS (Oil)	HPBAC	6.3.8.2	7-1
Pressure Maintaining Valve (PMV)	--	HPBAC	6.3.7.2	7-4
Pressure Reducing Regulator	AHP-V104	SCBA PANELS	6.4.5	7-6
Printed Circuit Board 1	1PCB	HPBAC	6.3.3.4	7-1
Printed Circuit Board 2	2PCB	HPBAC	6.3.3.5	7-1
Purifier/Dryer Assembly	--	HPBAC	6.3.7.3.2	7-4

**Table 6-3. Maintenance Reference Chart - Continued.**

Nomenclature	Designation	Assembly	Ch 6 Paragraph	Ch 7 Table
Rear Panel	--	HPBAC	6.3.1.3	7-1
Roof Panel	--	HPBAC	6.3.1.2	7-1
Relief Valve	AHP-V105	SCBA PANELS	6.4.6	7-6
SCBA Filter	F-207	SCBA PANELS	6.4.1	7-6
SCBA Filter and Charging Panels	--	SCBA PANELS	6.4	7-6
Silencer	--	HPBAC	6.3.6.1	7-3
Securus® Purification Monitor	--	HPBAC	6.3.7.1	7-4
Separator	--	HPBAC	6.3.6.2	7-3, 7-4
Side Access Panels	--	HPBAC	6.3.1.1	7-1
Silencer/Separator	--	HPBAC	6.3.6	7-3
Start Pushbutton Switch	--	HPBAC	6.3.4.2	7-3
Stop Valve	AHP-V103	SCBA PANELS	6.4.4	7-6
Terminal Block	--	HPBAC	6.3.3.6	7-1
Transformer	--	HPBAC	6.3.3.2	7-1
V-Belts	--	HPBAC	6.3.2	7-1, 7-2

**Table 6-4. Functional Test**

Step	Procedure
<div style="border: 1px solid black; padding: 10px; text-align: center;"> <b>WARNING</b> </div> <p><b>Before using the SCBA HP BACS, ensure that a gas sample has been taken within the last three months to ensure that the system is generating grade D air as defined by CGA G-7.1.</b></p> <p><b>Operator must wear protective eyewear and hearing protection to prevent personal injury.</b></p>	
1	Don protective eyewear and hearing protection.
2	Check work area for unsafe conditions such as slippery deck or contaminated atmosphere; clear area of debris or obstructions.
3	Check oil level on oil sight glass (8, Figure 6-35); fill as necessary.
4	Close all manual condensate drain valves.
5	Ensure inlet filter maintenance indicator (14, Figure 6-2) is depressed (not tripped).
6	Ensure condensate drain reservoir is 3/4 full; drain if necessary.
7	Ensure oil drain petcock is CLOSED (if applicable).

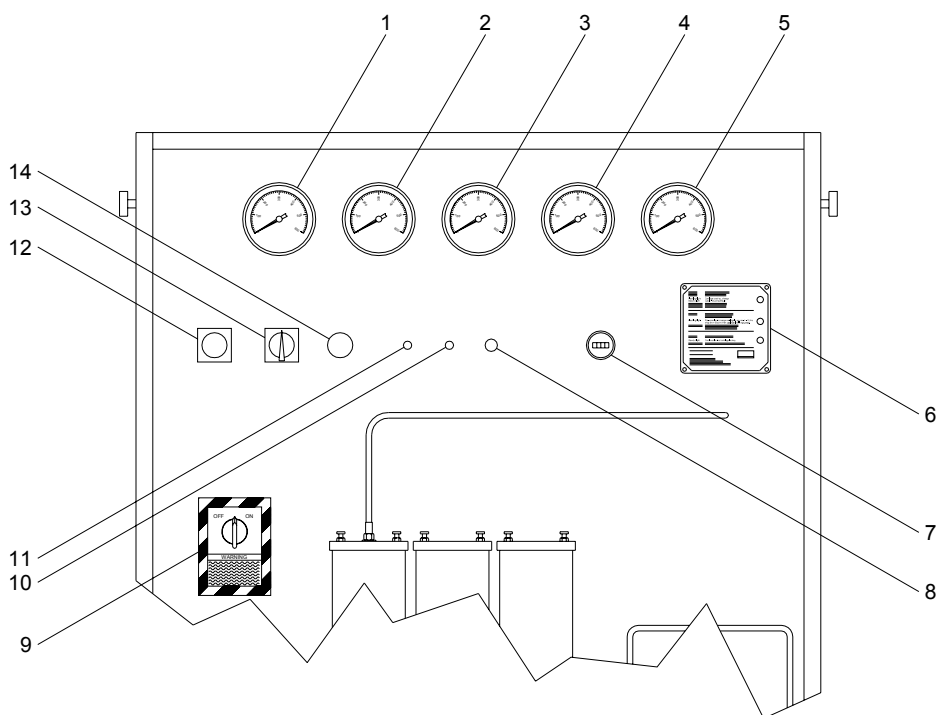


**Table 6-4. Functional Test - Continued.**

Step	Procedure																														
8	<div>Ensure SCBA HP BACS valves are aligned as follows:</div> <table><thead><tr><th>Function</th><th>No.</th><th>Alignment</th></tr></thead><tbody><tr><td>HPBAC Discharge Valve</td><td>HPBA-V1</td><td>locked open</td></tr><tr><td>Inlet Isolation Valve to SCBA Charging Panel</td><td>HPBA-V2</td><td>locked open</td></tr><tr><td>Outlet Isolation Valve from SCBA Charging Panel</td><td>HPBA-V3</td><td>locked open</td></tr><tr><td>Flask Inlet Valves (3 each)</td><td>HPBA-V4</td><td>locked open</td></tr><tr><td>Flask Drain Valves (3 each)</td><td>HPBA-V5</td><td>locked shut</td></tr><tr><td>Flask Drain Valves (3 each)</td><td>HPBA-V6</td><td>locked shut</td></tr><tr><td>SCBA Charging Panel Stop Valve</td><td>AHP-V103</td><td>normally shut</td></tr><tr><td>SCBA Charging Panel Gauge Isolation Valve</td><td>AHP-V106</td><td>normally open</td></tr><tr><td>SCBA Charging Panel Gauge Isolation Valve</td><td>AHP-V107</td><td>normally open</td></tr></tbody></table>	Function	No.	Alignment	HPBAC Discharge Valve	HPBA-V1	locked open	Inlet Isolation Valve to SCBA Charging Panel	HPBA-V2	locked open	Outlet Isolation Valve from SCBA Charging Panel	HPBA-V3	locked open	Flask Inlet Valves (3 each)	HPBA-V4	locked open	Flask Drain Valves (3 each)	HPBA-V5	locked shut	Flask Drain Valves (3 each)	HPBA-V6	locked shut	SCBA Charging Panel Stop Valve	AHP-V103	normally shut	SCBA Charging Panel Gauge Isolation Valve	AHP-V106	normally open	SCBA Charging Panel Gauge Isolation Valve	AHP-V107	normally open
Function	No.	Alignment																													
HPBAC Discharge Valve	HPBA-V1	locked open																													
Inlet Isolation Valve to SCBA Charging Panel	HPBA-V2	locked open																													
Outlet Isolation Valve from SCBA Charging Panel	HPBA-V3	locked open																													
Flask Inlet Valves (3 each)	HPBA-V4	locked open																													
Flask Drain Valves (3 each)	HPBA-V5	locked shut																													
Flask Drain Valves (3 each)	HPBA-V6	locked shut																													
SCBA Charging Panel Stop Valve	AHP-V103	normally shut																													
SCBA Charging Panel Gauge Isolation Valve	AHP-V106	normally open																													
SCBA Charging Panel Gauge Isolation Valve	AHP-V107	normally open																													
<div>NOTE</div> <div>The system can be configured for the following charging scenarios:</div> <div><div>(a)</div><div>1 or 2 SCBA cylinders,</div></div> <div><div>(b)</div><div>1 or 2 SCBA quick-charge hoses, or</div></div> <div><div>(c)</div><div>1 SCBA cylinder and 1 SCBA quick-charge hose.</div></div>																															
9	Turn Master ON/OFF selector switch (9, Figure 6-2) to ON.																														
10	Turn Power ON/OFF selector switch (13, Figure 6-2) to ON.																														
11	Press Start pushbutton switch (12, Figure 6-2). Record start time (hourmeter reading) in operating log (see Figure 2-6).																														
<div>NOTE</div> <div>The compressor operates automatically under control of the air pressure switch, and will trip (stop) when pressure rises to 5100 psig and will automatically restart when the pressure drops to 4400 psig. An abnormal condition in one of the monitored functions will also automatically stop the HPBAC. If automatic shutdown occurs because the parameters of monitored functions are exceeded, the condition must be corrected before the HPBAC can be restarted.</div>																															
12	Ensure dedicated fan coil unit power light is illuminated during HPBAC operations. If not illuminated, ensure fan coil breaker switch is in ON position.																														

**Table 6-4. Functional Test - Continued.**

Step	Procedure																						
13	<p>Check gauges and indicators as listed.</p> <table border="1"> <tr> <td>Oil Pressure Gauge</td><td>800 to 920 psig</td></tr> <tr> <td>1st Stage Air Pressure Gauge</td><td>50 to 60 psig</td></tr> <tr> <td>2nd Stage Air Pressure Gauge</td><td>230 to 275 psig</td></tr> <tr> <td>3rd Stage Air Pressure Gauge</td><td>1050 to 1200 psig</td></tr> <tr> <td>4th Stage Air Pressure Gauge</td><td>4400 to 5100 psig</td></tr> <tr> <td>Inlet Filter Maintenance Indicator and Reset Button</td><td>Reset Button <b>IN</b></td></tr> <tr> <td>Indicator Light, High Air Temp<sup>1</sup></td><td>Extinguished</td></tr> <tr> <td>Indicator Light, Low Oil Pressure<sup>2</sup></td><td>Extinguished</td></tr> <tr> <td>Oil Level</td><td>Between min and max</td></tr> <tr> <td>Condensate Reservoir</td><td>Fluid below 3/4 full</td></tr> <tr> <td>Securus® Purification Monitor<sup>3</sup></td><td>Green light illuminated</td></tr> </table>	Oil Pressure Gauge	800 to 920 psig	1st Stage Air Pressure Gauge	50 to 60 psig	2nd Stage Air Pressure Gauge	230 to 275 psig	3rd Stage Air Pressure Gauge	1050 to 1200 psig	4th Stage Air Pressure Gauge	4400 to 5100 psig	Inlet Filter Maintenance Indicator and Reset Button	Reset Button <b>IN</b>	Indicator Light, High Air Temp <sup>1</sup>	Extinguished	Indicator Light, Low Oil Pressure <sup>2</sup>	Extinguished	Oil Level	Between min and max	Condensate Reservoir	Fluid below 3/4 full	Securus® Purification Monitor <sup>3</sup>	Green light illuminated
Oil Pressure Gauge	800 to 920 psig																						
1st Stage Air Pressure Gauge	50 to 60 psig																						
2nd Stage Air Pressure Gauge	230 to 275 psig																						
3rd Stage Air Pressure Gauge	1050 to 1200 psig																						
4th Stage Air Pressure Gauge	4400 to 5100 psig																						
Inlet Filter Maintenance Indicator and Reset Button	Reset Button <b>IN</b>																						
Indicator Light, High Air Temp <sup>1</sup>	Extinguished																						
Indicator Light, Low Oil Pressure <sup>2</sup>	Extinguished																						
Oil Level	Between min and max																						
Condensate Reservoir	Fluid below 3/4 full																						
Securus® Purification Monitor <sup>3</sup>	Green light illuminated																						
14	Turn Power ON/OFF selector switch (13, Figure 6-2) to OFF position.																						
15	Turn Master ON/OFF selector switch (9, Figure 6-2) to OFF position.																						

**Figure 6-2. Functional Test**

**WARNING**

**Do not loosen or tighten fittings while system is under pressure. Failure to comply could result in death or injury to personnel and damage to equipment.**

**High Pressure (HP) compressed air may be relieved in one stage and still be contained in another. Ensure that all stages are vented as the sudden release of energy from HP air can create airborne particles that may enter eyes or penetrate skin.**

**Hazardous voltage can cause severe injury or death. Disconnect all power to the HPBAC and tag out before servicing equipment.**

**High surface temperatures of the compressor and drive motor can cause burns. Allow the unit to cool before servicing.**

**Before opening bleed valves, ensure all personnel stand clear of area to avoid injury from flying debris. Operator shall announce *Bleeding down* to warn nearby personnel. Operator must wear protective eyewear and hearing protection to prevent personal injury.**

**NOTE**

When performing maintenance on the HPBAC and its subcomponents, be sure to observe the general maintenance instructions outlined in paragraph 4.5.

If a procedure cannot be performed, contact in-service engineering agent for instructions on how to proceed.

**6.3.1 ACCESS PANELS.** Corrective maintenance of the HPBAC access panels is limited to replacement of missing or damaged nameplates or labels, removal and replacement of damaged panels, and removal and reinstallation of panels when access to the components that are internal to the compressor is required. The HPBAC access panels are shown below in the order in which they appear in this section.

- Paragraph 6.3.1.1 — Side Access Panels
- Paragraph 6.3.1.2 — Roof Panel
- Paragraph 6.3.1.3 — Rear Panel
- Paragraph 6.3.1.4 — Belt Guard Panel
- Paragraph 6.3.1.5 — Electrical Enclosure Access Panel

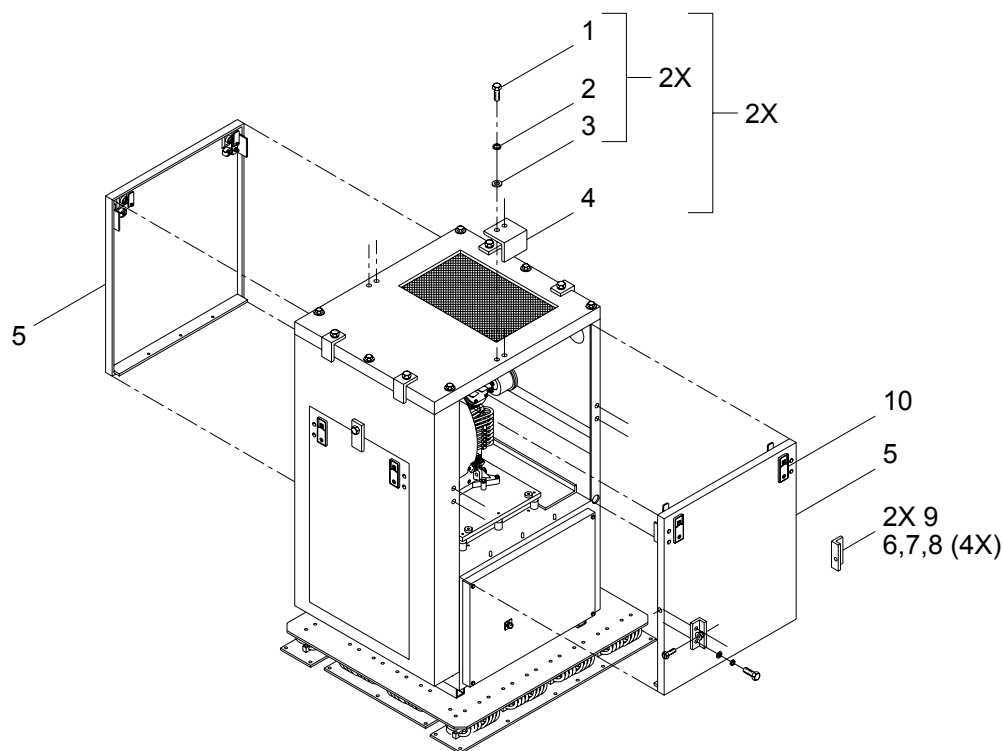
**6.3.1.1 Side Access Panels.** Remove and replace or reinstall the HPBAC side access panels IAW the following procedure. Callouts refer to Figure 6-3 unless otherwise noted.

#### NOTE

Side access panels are side-specific. Maintenance personnel should note sides when both are removed simultaneously. Do not attempt to force panels to fit.

a. Removal (Figure 6-3).

- (1) Using 9/16" socket wrench, remove bolts (1), lock washers (2), and washers (3) securing angles (4) to tops of side access panels (5) and frame; remove angles.
- (2) Remove all bolts (6), lock washers (7), and washers (8) securing angles (9) to side access panels (5) and frame; remove all angles.
- (3) Turn knobs (10) 90 degrees to free side access panels (5) from frame.
- (4) Lift side access panels (5) and remove from frame.



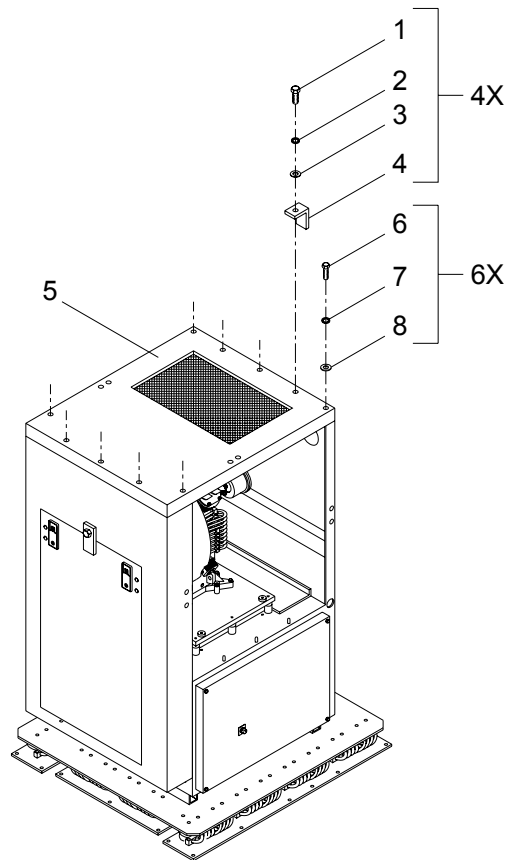
**Figure 6-3. Side Access Panels**

b. Replacement or Reinstallation (Figure 6-3).

- (1) Set bases of side access panels (5) over pins in frame; push in top of panel and turn knobs (10) to engage frame.
- (2) Install all side angles (9) and secure with washers (8), lock washers (7), and bolts (6).
- (3) Install top angles (4), and secure with washers (3), lock washers (2), and bolts (1).

**6.3.1.2 Roof Panel.** Remove and replace or reinstall the HPBAC roof panel IAW the following procedure. Callouts refer to Figure 6-4 unless otherwise noted.

- a. Removal (Figure 6-4).
  - (1) Remove both side access panels IAW paragraph 6.3.1.1.a.
  - (2) Using 9/16" socket wrench, remove bolts (1), lock washers (2), and washers (3) securing angles (4) to roof panel (5) and frame; remove angles.
  - (3) Using 7/16" socket wrench, remove all roof panel bolts (6), lock washers (7), and washers (8) securing roof panel (5) to frame.
  - (4) Remove roof panel (5).

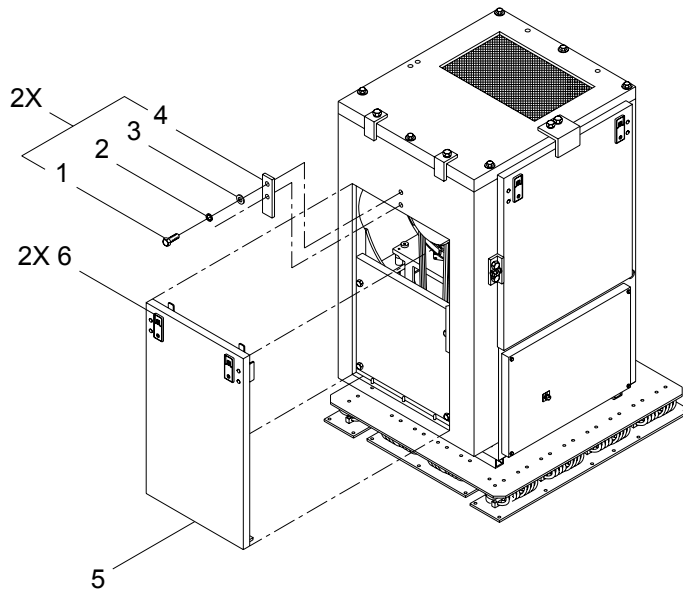


**Figure 6-4. Roof Panel**

- b. Replacement or Reinstallation (Figure 6-4).
  - (1) Install roof panel (5), ensuring orientation matches Figure 6-4.
  - (2) Secure roof panel (5) to frame using washers (8), lock washers (7), and bolts (6).
  - (3) Install angles (4) and secure with washers (3), lock washers (2), and bolts (1).
  - (4) Install both side access panels IAW paragraph 6.3.1.1.b.

**6.3.1.3 Rear Panel.** Remove and replace or reinstall the HPBAC rear panel IAW the following procedure. Callouts refer to Figure 6-5 unless otherwise noted.

- a. Removal (Figure 6-5).
  - (1) Using 9/16" socket wrench, remove bolts (1), lock washers (2), and washers (3) securing rear panel plate (4) to rear access panel (5) and frame; remove plate.
  - (2) Turn knobs (6) 90 degrees to free top of rear panel (5) from frame.
  - (3) Lift rear panel (5) and remove from frame.



**Figure 6-5. Rear Panel**

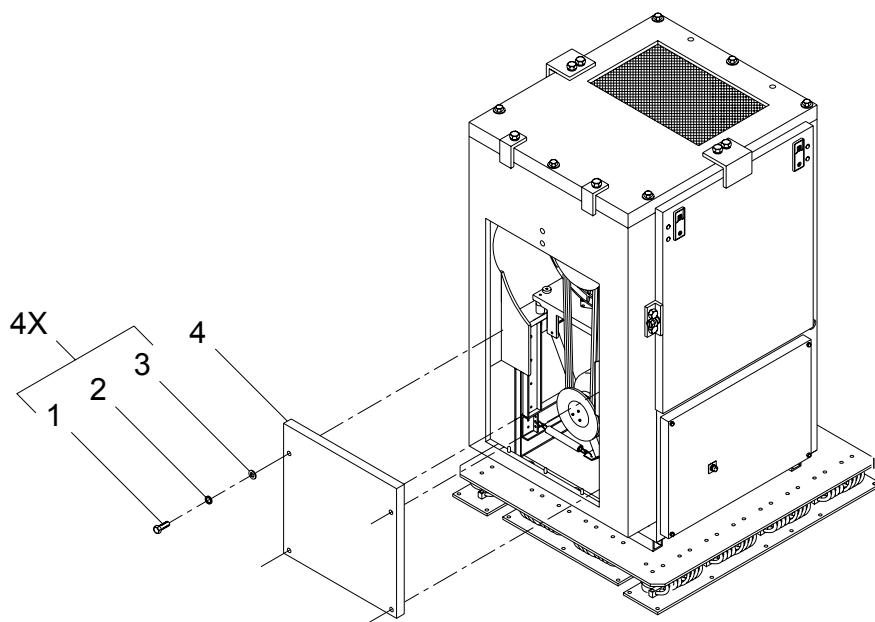
- b. Replacement or Reinstallation (Figure 6-5).
  - (1) Install rear panel (5) on bottom edge of frame; push in top of panel and turn knobs (6) 90° to engage frame.
  - (2) Install rear panel plate (4) and secure with washers (3), lock washers (2), and bolts (1).



**6.3.1.4 Belt Guard Panel.** Remove and replace or reinstall the HPBAC belt guard panel IAW the following procedure. Callouts refer to Figure 6-6 unless otherwise noted.

a. Removal (Figure 6-6).

- (1) Remove rear panel IAW paragraph 6.3.1.3.a.
- (2) Using 7/16" socket wrench, remove all four sets of bolts (1), lock washers (2), and washers (3) securing belt guard panel (4) to frame; remove belt guard panel.



**Figure 6-6. Belt Guard Panel**

b. Replacement or Reinstallation (Figure 6-6).

- (1) Install belt guard panel (4) and secure with all four sets of washers (3), lock washers (2), and bolts (1).
- (2) Install rear panel IAW paragraph 6.3.1.3.b.

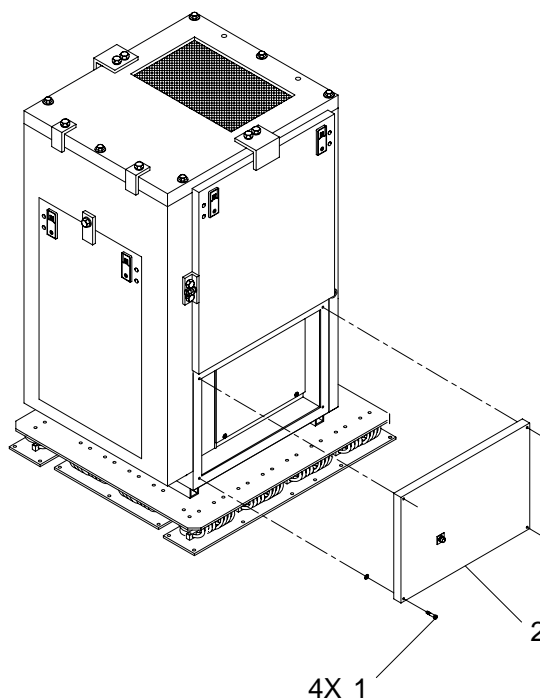
**6.3.1.5 Electrical Enclosure Access Panel.** Remove and replace or reinstall the HPBAC electrical enclosure access panel IAW the following procedure. Callouts refer to Figure 6-7 unless otherwise noted.

- a. Removal (Figure 6-7).

**NOTE**

Captive bolts do not separate from the electrical enclosure access panel.

- (1) Using 7/16" socket wrench, loosen all four captive bolts (1) securing electrical enclosure access panel (2) to frame.
- (2) Remove electrical enclosure access panel (2).



**Figure 6-7. Electrical Enclosure Access Panel**

- b. Replacement or Reinstallation (Figure 6-7).
  - (1) Install electrical enclosure access panel (2).
  - (2) Secure electrical enclosure access panel (2) to frame with all four captive bolts (1).

**6.3.2 V-BELTS.** Corrective maintenance of the drive V-belts (paragraph 6.3.2.1) and the oil pump drive V-belt (paragraph 6.3.2.2) is limited to removal and replacement.

**6.3.2.1 Drive V-Belts.** Remove and replace the drive V-belts IAW the following procedures. Callouts refer to Figure 6-8 unless otherwise noted.

<b>WARNING</b>
----------------

**To prevent injury, system must be tagged out prior to performing maintenance.**

**NOTE**

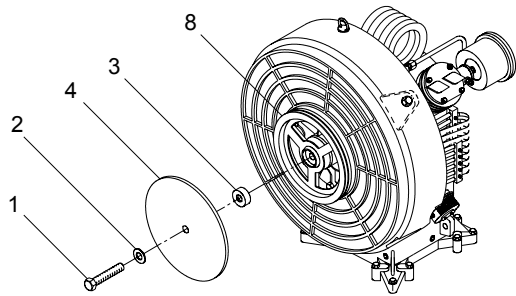
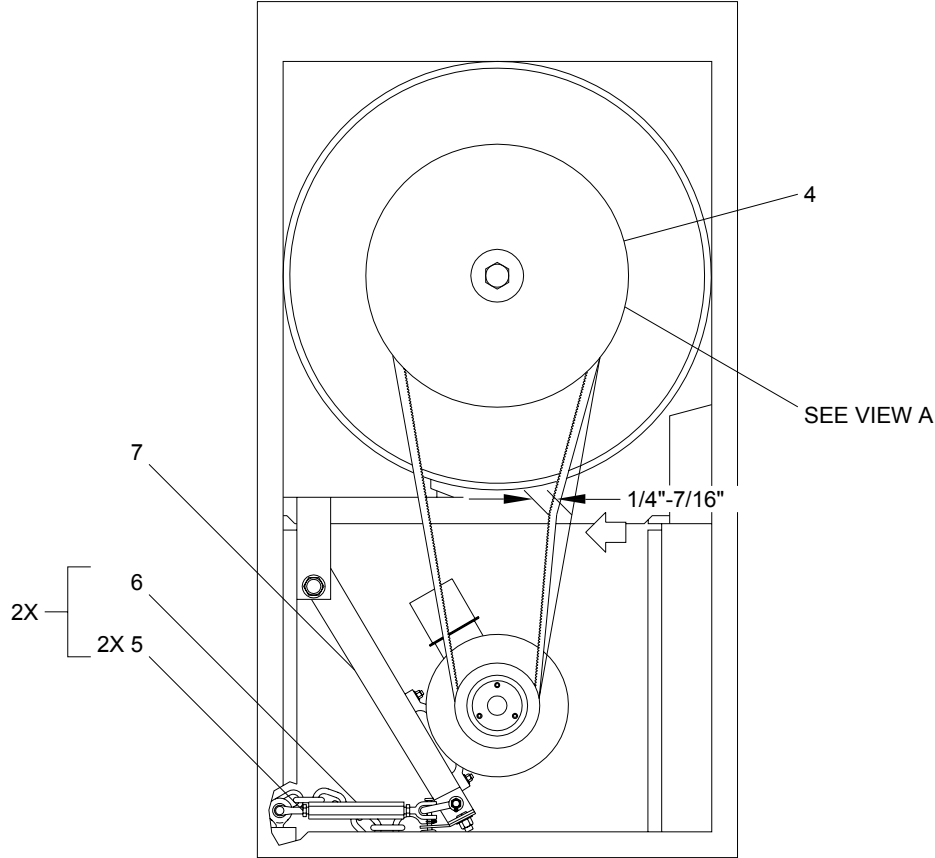
Always replace the drive V-belts as a matched set.

- a. Tag out system IAW current shipboard instructions.
- b. Removal (Figure 6-8).
  - (1) Remove rear panel IAW paragraph 6.3.1.3.a.
  - (2) Remove belt guard panel IAW paragraph 6.3.1.4.a.

**NOTE**

When removing bolt (1), hold belts by hand to keep flywheel from turning.

- (3) Using 3/4" open end wrench, remove bolt (1) and washer (2) securing flywheel belt guard (4) and spacer (3); remove belt guard and spacer.
- (4) Loosen locknuts (5) on each end of both turnbuckles (6) located at each end of motor mounting plate (7).
- (5) Using 10" crescent wrench, loosen turnbuckles (6) as required to allow motor mounting plate (7) to rotate slightly so belts can be removed.
- (6) Using screwdriver, lead front belt over edge of flywheel (8) and rotate flywheel by hand until belt is free.
- (7) Lead rear belt to front sheave and over edge of flywheel (8) and rotate flywheel by hand until belt is free.



VIEW A

Figure 6-8. Drive V-Belt

c. Replacement (Figure 6-8).

- (1) Install inner belt by placing over inner sheave of motor. With belt led over edge of flywheel (8), turn flywheel by hand to allow belt to run onto inner sheave.
- (2) Install outer belt by placing over outer sheave of motor. With belt led over edge of flywheel (8), turn flywheel by hand to allow belt to run onto outer sheave.
- (3) Ensure belts are not twisted.

**NOTE**

Do not over-tighten turnbuckles; belt tension is achieved by the weight of the motor, not the turnbuckles.

- (4) Tighten turnbuckles (6) just until slack is removed.
- (5) Check belt tension by pressing on belts by hand with nominal pressure. Belts should deflect 1/4" to 7/16".
- (6) Tighten locknuts (5) on turnbuckles (6).

**NOTE**

Hold belts by hand when tightening bolt (1).

- (7) Replace spacer (3) and flywheel belt guard (4); secure with washer (2) and bolt (1).
- (8) Replace motor belt guard panel IAW paragraph 6.3.1.4.b.
- (9) Replace rear panel IAW paragraph 6.3.1.3.b; remove Out of Service tag.

d. Perform functional test IAW Table 6-4.

**6.3.2.2 Oil Pump Drive V-Belt.** Remove and replace the oil pump drive V-belt IAW the following procedures. Callouts refer to Figure 6-9 unless otherwise noted.

<b>WARNING</b>
----------------

**To prevent injury, system must be tagged out prior to performing maintenance.**

- a. Tag out system IAW current shipboard instructions.
- b. Removal (Figure 6-9).
  - (1) Remove right side access panel (when facing front of compressor) IAW paragraph 6.3.1.1.a.
  - (2) Using 1/2" socket wrench, remove nuts (1), washers (2), and front metal plate (3) securing oil pump drive V-belt guard (4) to compressor; remove drive V-belt guard and rear metal plate (3).

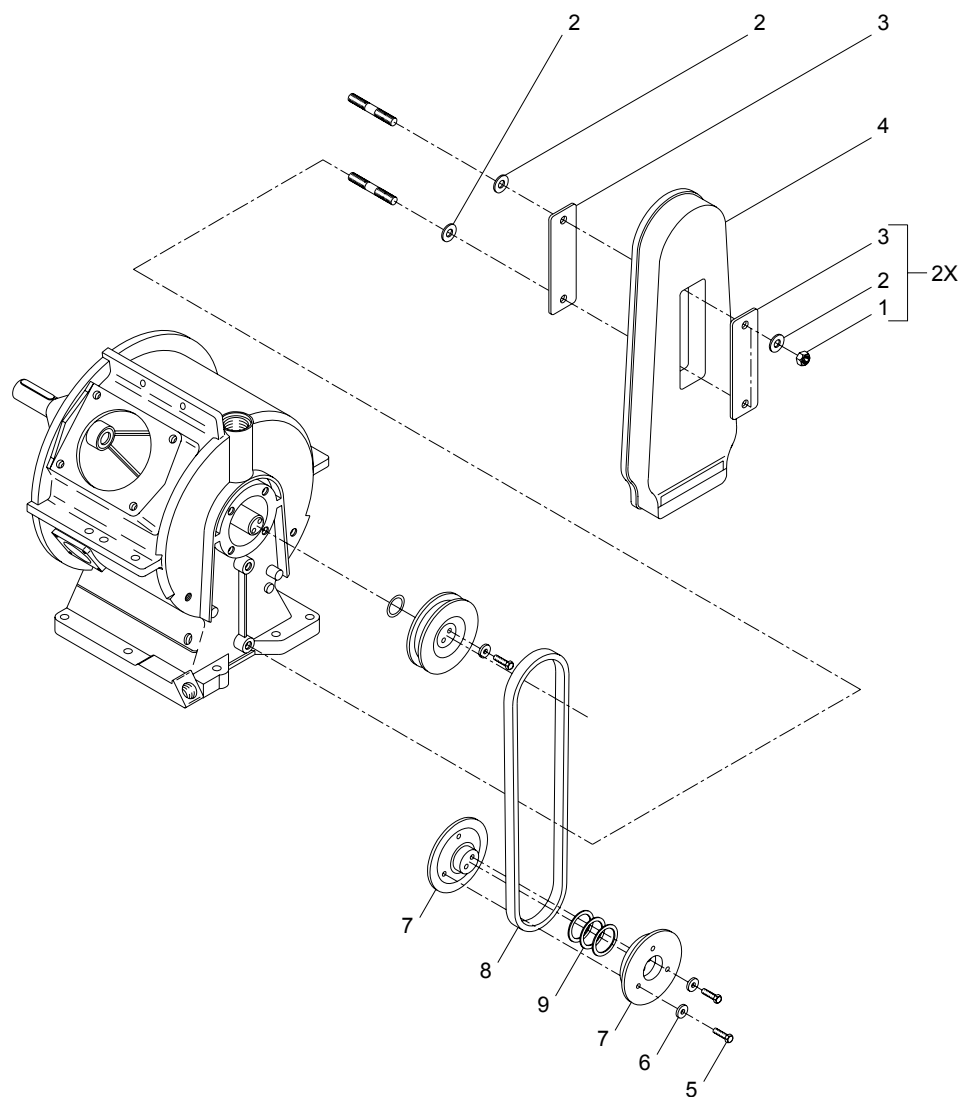
**NOTE**

Check that oil pump drive V-belt tension is correct. V-belt should move approximately 3/16" to 3/8" under nominal pressure.

- (3) Using 5mm allen wrench, remove screws (5), washers (6), front sheave plate (7), and oil pump drive V-belt (8).

**NOTE**

If V-belt requires adjustment only, proceed to step c. If V-belt requires replacement, proceed to step d.



**Figure 6-9. Oil Pump Drive V-Belt**



c. Adjustment (Figure 6-9).

**NOTE**

Retain removed shims for use as spares.

- (1) Carefully inspect belt for wear, especially cracks.
- (2) To increase oil pump drive V-belt tension, remove one shim (9) and place on shaft behind sheave.
- (3) To decrease oil pump drive V-belt tension, add one shim (9) between sheave plates (7).
- (4) Check tension (V-belt should move approximately 3/16" to 3/8" under nominal pressure) and add or remove shims one at a time until proper tension is achieved.

d. Replacement (Figure 6-9).

- (1) Install new oil pump drive V-belt (8) over upper pulley, and install front half of lower sheave plate (7); ensure screw holes on front and back halves of sheave plate align.
- (2) Install washers (6) and screws (5) approximately 1 – 2 turns each.
- (3) Tighten screws (5) slightly and rotate compressor to ensure V-belt (8) rides evenly in sheave.
- (4) Hold oil pump drive V-belt (8) and tighten screws (5) securely.
- (5) Check oil pump drive V-belt tension (V-belt should move approximately 3/16" to 3/8" under nominal pressure) and adjust IAW step c until correct tension is achieved.
- (6) Install rear metal plate (3), oil pump drive V-belt guard (4), front metal plate, washers (2), and nuts (1).
- (7) Install side access panel IAW paragraph 6.3.1.1.b; remove Out of Service tag.

e. Perform functional test IAW Table 6-4.

**WARNING**

**Hazardous voltage can cause severe injury or death. Disconnect all power to the HPBAC and tag out before servicing equipment.**

**CAUTION**

**When removing electrical components, label all wires to ensure correct wiring during replacement. Failure to wire components correctly can result in damage to equipment.**

**6.3.3 ELECTRICAL PANEL.** Corrective maintenance of the electrical panel (Figure 6-10) is limited to inspection and checks of electrical components, as well as removal and replacement of the following electrical panel components:

- Paragraph 6.3.3.1 — Overload Relay and Motor Starter
- Paragraph 6.3.3.2 — Transformer
- Paragraph 6.3.3.3 — Automatic Condensate Drain (ACD) Timer
- Paragraph 6.3.3.4 — Printed Circuit Board 1 (1PCB)
- Paragraph 6.3.3.5 — Printed Circuit Board 2 (2PCB)
- Paragraph 6.3.3.6 — Terminal Block

**6.3.3.1 Overload Relay and Motor Starter.** Corrective maintenance for the overload relay and motor starter is limited to removal, replacement, and inspection. Callouts refer to Figure 6-11 unless otherwise noted.

**WARNING**

**To prevent injury, system must be tagged out prior to performing maintenance.**

- a. Tag out system IAW current shipboard instructions.
- b. Removal (Figure 6-11).
  - (1) Ensure power is OFF.

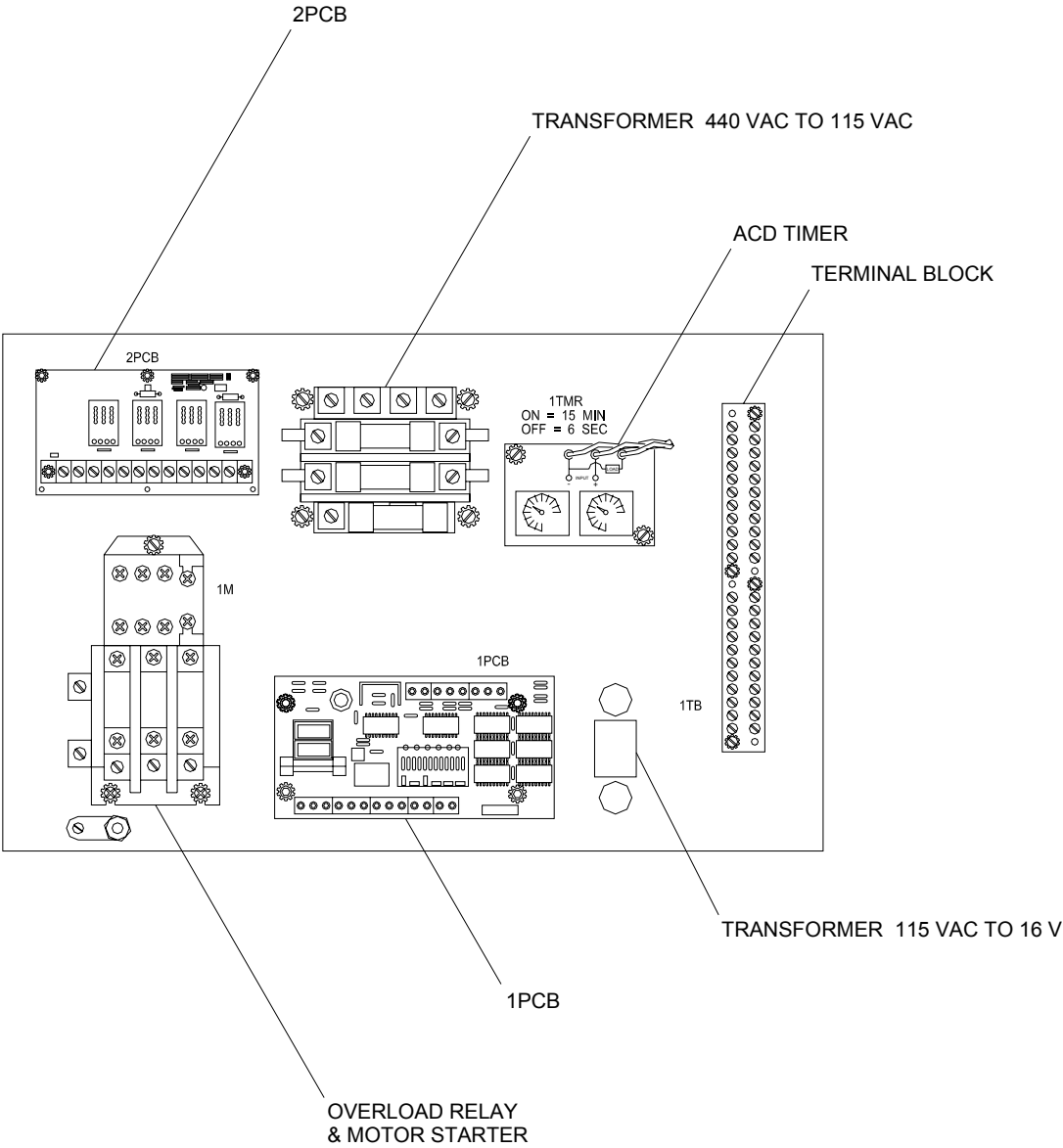


Figure 6-10. Electrical Panel

- (2) Ensure power is OFF.
- (3) Remove electrical enclosure access panel IAW paragraph 6.3.1.5.a.

#### **NOTE**

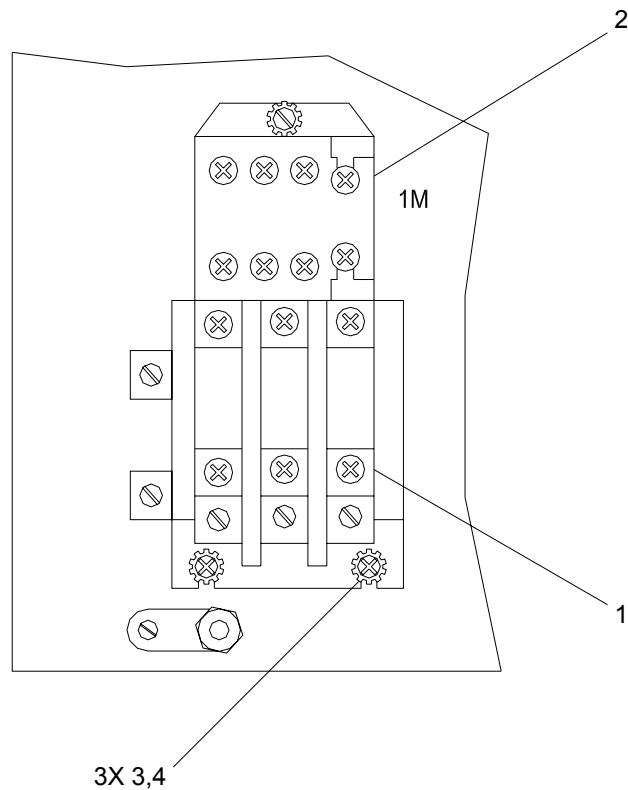
If a digital camera is available, photograph overload relay/motor starter before proceeding to facilitate rewiring.

Figure 5-3 provides an electrical wiring diagram of the electrical panel.

- (4) Label all wires connected to overload relay (1).
- (5) Using small flathead screwdriver, disconnect all wires connected to overload relay (1).
- (6) Label all wires connected to motor starter (2).
- (7) Using medium flathead screwdriver, disconnect all wires connected to motor starter (2).
- (8) Remove top screw (3) and lock washer (4) and loosen bottom two screws and lock washers securing motor starter (2) and overload relay (1) to electrical panel; lift overload relay and motor starter off bottom screws and remove from electrical panel.

c. Inspection and Checks.

- (1) Inspect wire harness and terminals for damaged insulation, broken connections, weak solder joints, loose or damaged shrink tubing, and any visible signs of arcing, heat damage, or other damage.
- (2) Perform continuity check for suspected faults IAW Table 6-5.
- (3) Check any other suspect connections by referring to Figures 5-2 and 5-3.



**Figure 6-11. Overload Relay and Motor Starter**

- d. Replacement (Figure 6-11).
- (1) Slide motor starter (2) and overload relay (1) onto bottom two screws (3).
  - (2) Install top screw (3) and lock washer (4), and tighten all screws.
  - (3) Reconnect wiring to motor starter (2) and overload relay (1) IAW labeling and Figure 5-3.
  - (4) Replace electrical enclosure access panel IAW paragraph 6.3.1.5.b; remove Out of Service tag.

- e. Perform functional test IAW Table 6-4.

**Table 6-5. Continuity Check**

<b>Contact Points</b>	<b>Open Circuit Probable Fault</b>
1TB1 to X1	Blown Fuse 1FU
L1 to H1	Blown Fuse 2FU
L2 to H4	Blown Fuse 3FU
2PCB4 to 1TB4	Defective Air Pressure Switch
1TB12 to 1TB18	Defective Air Temperature Switch
1TB2 to 1TB26*	Defective ACD Solenoid
T1 to T2, T1 to T3, T2 to T3	Defective Motor
<b>Contact Points</b>	<b>Closed Circuit Probable Fault</b>
1TB12 to 1TB14	Defective Oil Pressure Switch
1TB7 to 2PCB2	Defective Power ON/OFF Selector Switch
1TB3 to 2PCB1	Defective Start Pushbutton Switch

\* Should be 1.5 ohms or less

**6.3.3.2 Transformer.** Corrective maintenance for the transformer is limited to removal, replacement, and inspection. Callouts refer to Figure 6-12 unless otherwise noted.

<b>WARNING</b>
----------------

**To prevent injury, system must be tagged out prior to performing maintenance.**

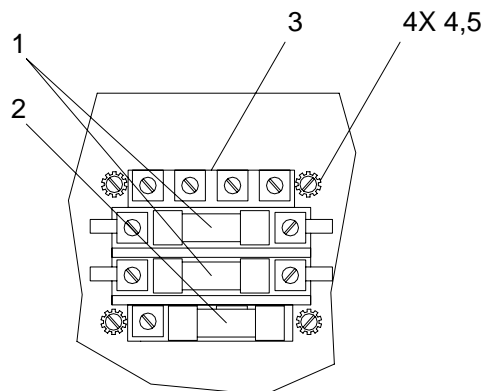
- a. Tag out system IAW current shipboard instructions.
- b. Removal (Figure 6-12).
  - (1) Ensure power is OFF.
  - (2) Remove electrical enclosure access panel IAW paragraph 6.3.1.5.a.
  - (3) Remove primary fuses (1) and secondary fuse (2).
  - (4) Label all wires connected to transformer (3).
  - (5) Using medium flathead screwdriver, disconnect all wires connected to transformer (3).
  - (6) Using medium flathead screwdriver, remove screws (4) and lock washers (5) securing transformer (3) to electrical panel; remove transformer.
- c. Inspection and checks.
  - (1) Perform inspection and checks IAW paragraph 6.3.3.1.c.
  - (2) Perform continuity check on fuses.

- d. Replacement (Figure 6-12).

**NOTE**

Ensure ground connection is re-established under lower left mounting screw.

- (1) Install new transformer (3); secure with lock washers (5) and screws (4).
  - (2) Reconnect wiring to transformer (3) IAW labeling and Figure 5-3.
  - (3) Install primary fuses (1) and secondary fuse (2).
  - (4) Replace electrical enclosure access panel IAW paragraph 6.3.1.5.b; remove Out of Service tag.
- e. Perform functional test IAW Table 6-4.



**Figure 6-12. Transformer**

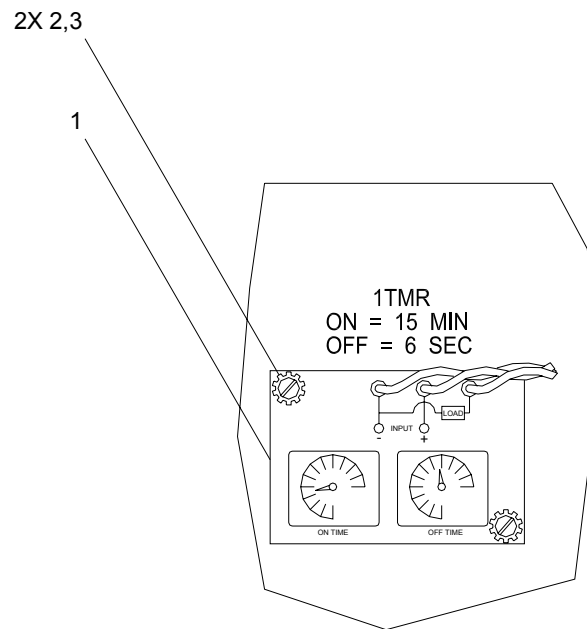


**6.3.3.3 Automatic Condensate Drain (ACD) Timer.** Corrective maintenance for the ACD timer is limited to removal, replacement, and inspection. Callouts refer to Figure 6-13 unless otherwise noted.

<b>WARNING</b>
----------------

**To prevent injury, system must be tagged out prior to performing maintenance.**

- a. Tag out system IAW current shipboard instructions.
- b. Removal (Figure 6-13).
  - (1) Ensure power is OFF.
  - (2) Remove electrical enclosure access panel IAW paragraph 6.3.1.5.a.
  - (3) Label all wires connected to ACD timer (1).
  - (4) Remove all wires connected to ACD timer (1).
  - (5) Using medium flathead screwdriver, remove screws (2) and lock washers (3) securing ACD timer (1) to electrical panel, and remove ACD timer.
- c. Perform inspection and checks IAW paragraph 6.3.3.1.c.
- d. Replacement (Figure 6-13).
  - (1) Install new ACD timer (1); secure with lock washers (3) and screws (2).
  - (2) Reconnect wiring to ACD timer (1) IAW labeling and Figure 5-3.
  - (3) Ensure ON time is set to 15 minutes and OFF time is set to 6 seconds.
  - (4) Replace electrical enclosure access panel IAW paragraph 6.3.1.5.b; remove Out of Service tag.
- e. Perform functional test IAW Table 6-4.



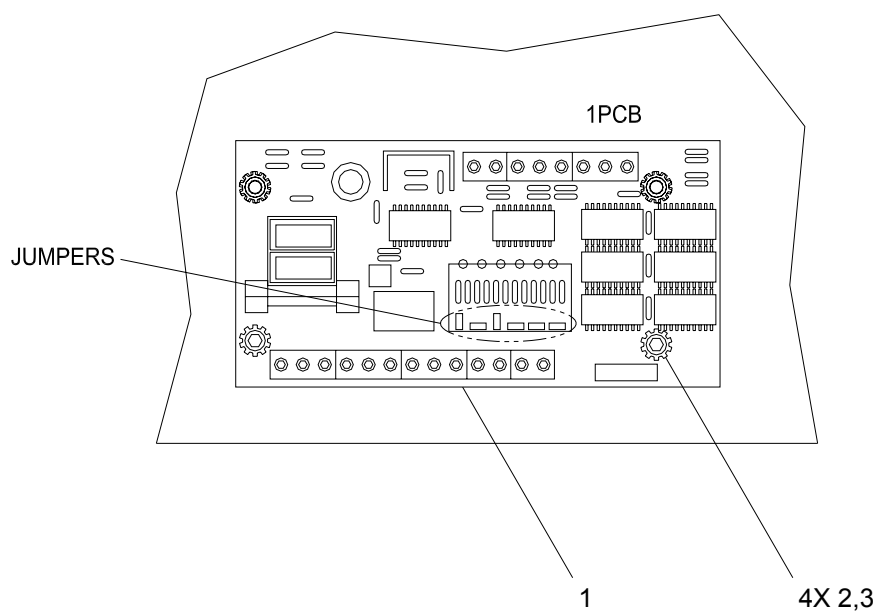
**Figure 6-13. Automatic Condensate Drain (ACD) Timer**

**6.3.3.4 Printed Circuit Board 1 (1PCB).** Corrective maintenance for 1PCB is limited to removal, replacement, and inspection. Callouts refer to Figure 6-14 unless otherwise noted.

<b>WARNING</b>
----------------

**To prevent injury, system must be tagged out prior to performing maintenance.**

- a. Tag out system IAW current shipboard instructions.
- b. Removal (Figure 6-14).
  - (1) Ensure power is OFF.
  - (2) Remove electrical enclosure access panel IAW paragraph 6.3.1.5.a.
  - (3) Label all wires connected to 1PCB (1).
  - (4) Using very small flathead screwdriver, disconnect all wires connected to 1PCB (1).
  - (5) Using 7/64" allen wrench, remove screws (2) and washers (3) securing 1PCB (1) to electrical panel; remove 1PCB.
- c. Perform inspection and checks IAW paragraph 6.3.3.1.c.
- d. Replacement (Figure 6-14).
  - (1) Verify jumpers are oriented as shown in Figure 6-14.
  - (2) Reconnect wiring to 1PCB (1) IAW labeling and Figure 5-3.
  - (3) Install new 1PCB (1) and secure with washers (3) and screws (2).
  - (4) Replace electrical enclosure access panel IAW paragraph 6.3.1.5.b; remove Out of Service tag.
- e. Perform functional test IAW Table 6-4.



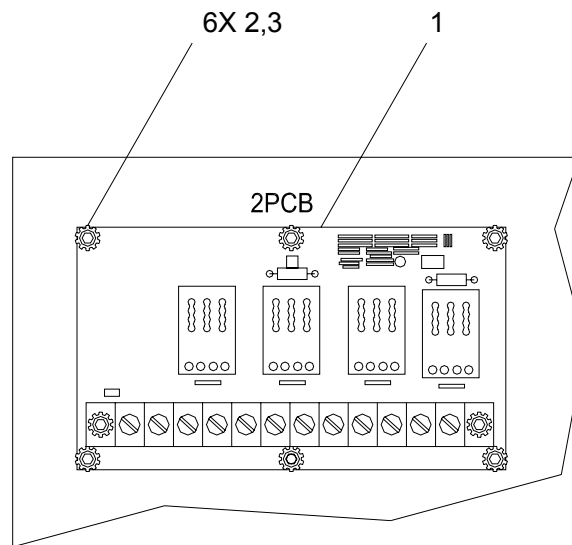
**Figure 6-14. Printed Circuit Board 1 (1PCB)**

**6.3.3.5 Printed Circuit Board 2 (2PCB).** Corrective maintenance for 2PCB is limited to removal, replacement, and inspection. Callouts refer to Figure 6-15 unless otherwise noted.

<b>WARNING</b>
----------------

**To prevent injury, system must be tagged out prior to performing maintenance.**

- a. Tag out system IAW current shipboard instructions.
- b. Removal (Figure 6-15).
  - (1) Ensure power is OFF.
  - (2) Remove electrical enclosure access panel IAW paragraph 6.3.1.5.a.
  - (3) Label all wires connected to 2PCB (1).
  - (4) Using medium flathead screwdriver, disconnect all wires connected to 2PCB (1).
  - (5) Using 7/64" allen wrench, remove screws (2) and washers (3) securing 2PCB (1) to electrical panel; remove 2PCB.
- c. Perform inspection and checks IAW paragraph 6.3.3.1.c.
- d. Replacement (Figure 6-15).
  - (1) Install new 2PCB (1) and secure with washers (3) and screws (2).
  - (2) Reconnect wiring to 2PCB (1) IAW labeling and Figure 5-3.
  - (3) Replace electrical enclosure access panel IAW paragraph 6.3.1.5.b; remove Out of Service tag.
- e. Perform functional test IAW Table 6-4.



**Figure 6-15. Printed Circuit Board 2 (2PCB)**

**6.3.3.6 Terminal Block.** There is no corrective maintenance requirement for the terminal block (Figure 6-10) at the organizational level.

<b>WARNING</b>
----------------

**Do not attempt to remove or disassemble pressurized equipment. Stop all equipment operation and vent pneumatic pressure to atmosphere prior to performing maintenance. Failure to comply can result in injury to personnel.**

**Hazardous voltage can cause severe injury or death. Disconnect all power to the HPBAC and tag out before servicing equipment.**

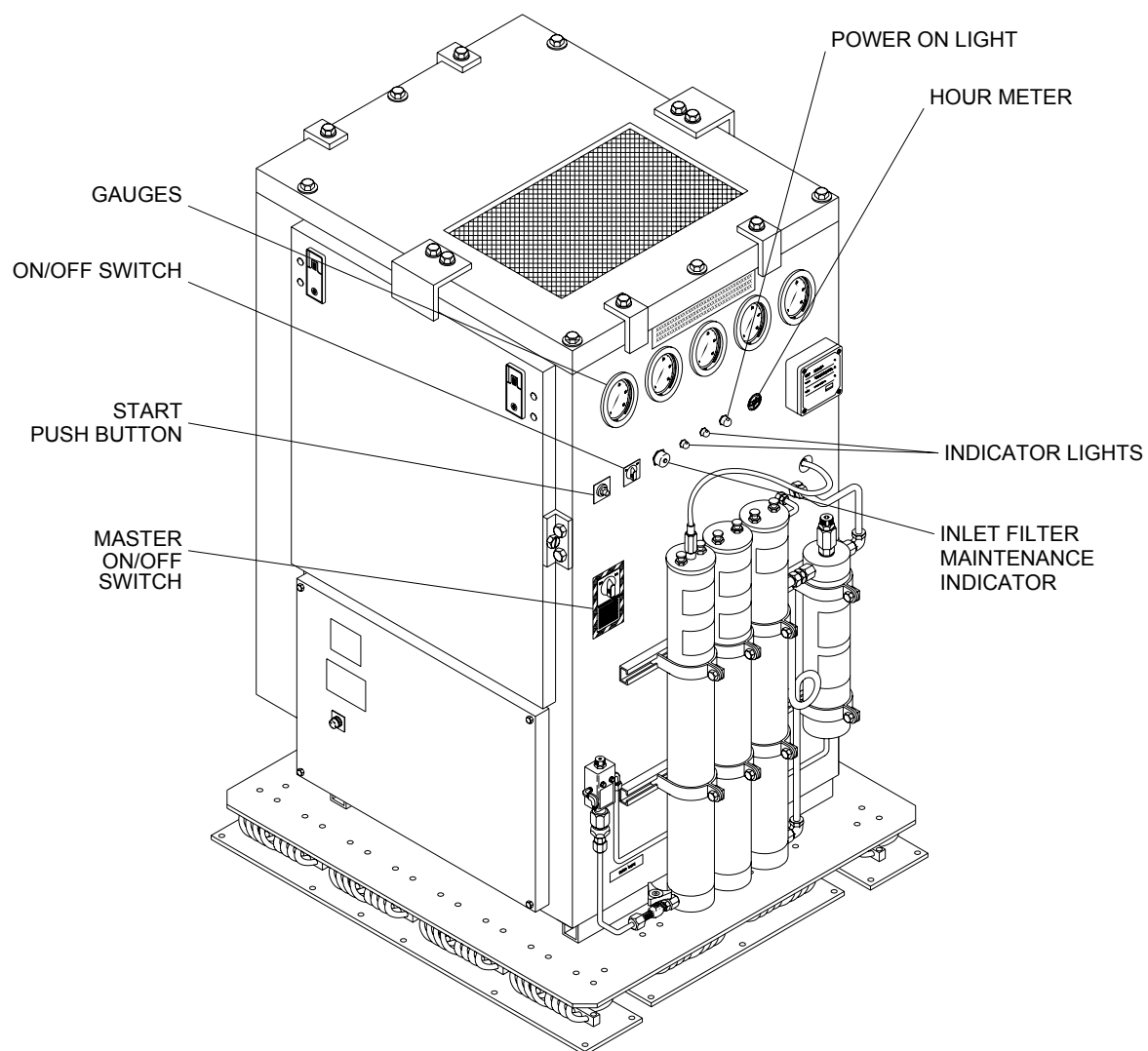
**High Pressure (HP) compressed air may be relieved in one stage and still be contained in another. Ensure that all stages are vented as the sudden release of energy from HP air can create airborne particles that may enter eyes or penetrate skin.**

**NOTE**

When performing maintenance on the instrument and control panel, clean and inspect IAW general procedures listed in paragraphs 4.5.9 and 4.5.10.

**6.3.4 INSTRUMENT AND CONTROL PANEL.** Corrective maintenance of the instrument and control panel (Figure 6-16) is limited to removal and replacement of the following components located on the panel:

- Paragraph 6.3.4.1 — HPBAC Gauges
- Paragraph 6.3.4.2 — Start Pushbutton Switch
- Paragraph 6.3.4.3 — Power ON/OFF Selector Switch
- Paragraph 6.3.4.4 — Master ON/OFF Selector Switch
- Paragraph 6.3.4.5 — Inlet Filter Maintenance Indicator
- Paragraph 6.3.4.6 — Indicator Lights
- Paragraph 6.3.4.7 — Hourmeter



**Figure 6-16. Instrument and Control Panel**



**6.3.4.1 HPBAC Gauges.** Corrective maintenance for the HPBAC gauges is limited to removal and replacement. Callouts refer to Figure 6-17 unless otherwise noted.

**WARNING**

**To prevent injury, system must be tagged out prior to performing maintenance.**

**CAUTION**

**To prevent damage to the gauge, use two wrenches when breaking connection and when reconnecting.**

**6.3.4.1.1 Air Pressure Gauges.**

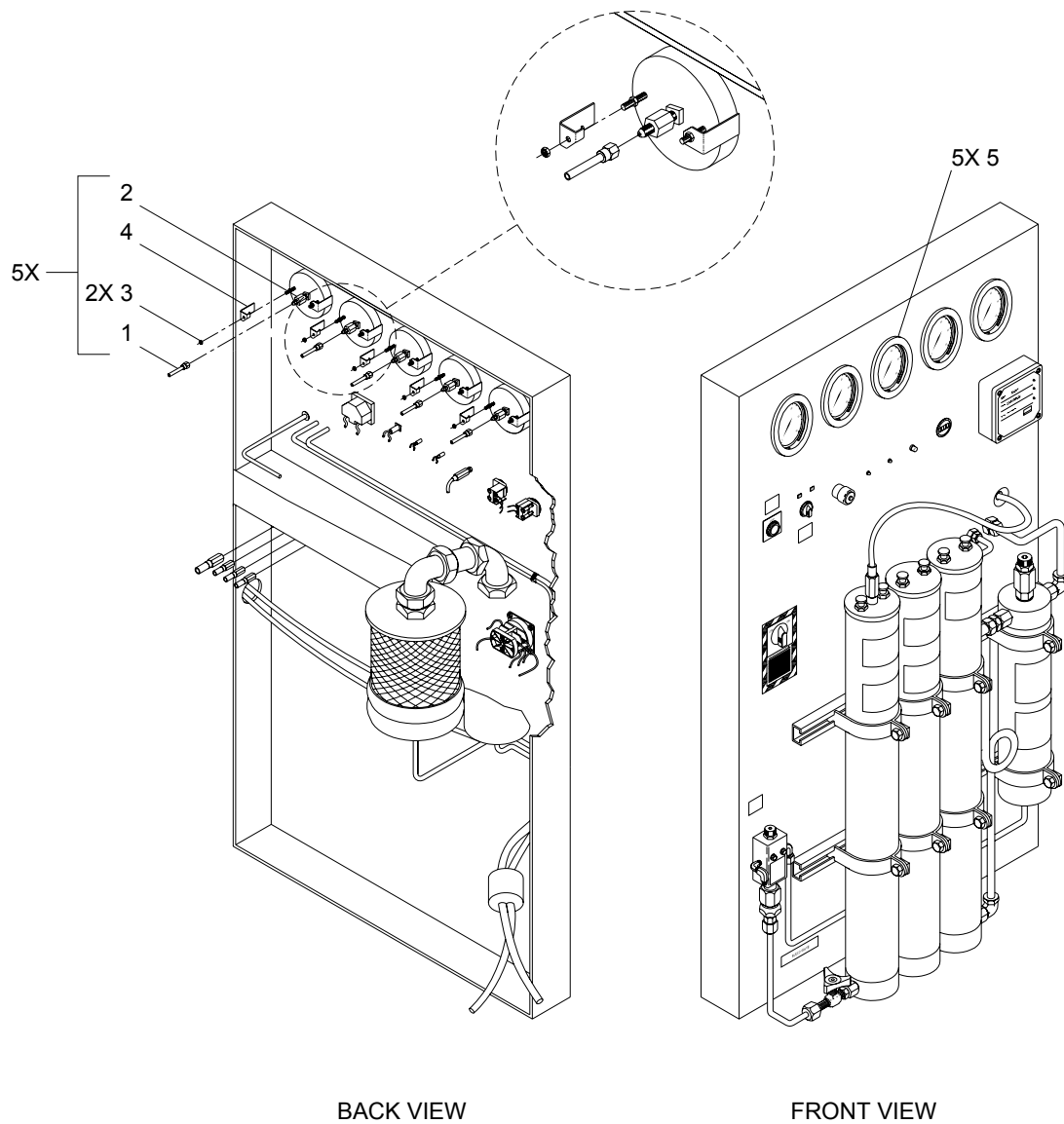
- a. Tag out system IAW current shipboard instructions.
- b. Perform system depressurization IAW paragraph 6.2.5.a.
- c. Removal (Figure 6-17).
  - (1) Ensure power is OFF.
  - (2) Remove side access panels IAW paragraph 6.3.1.1.a.
  - (3) Using one 7/16" open end wrench and one 3/4" open end wrench, break connection between tube connector (1) and adapter (2).

**NOTE**

To maintain cleanliness of air system, cap, plug, or double bag all fittings and connections while performing maintenance (if not replacing immediately).

- (4) Using 3/8" open end wrench, remove both nylon nuts (3) and brackets (4) securing gauge (5) to instrument and control panel.
- (5) Remove gauge (5) from front of instrument and control panel.

- (6) Using 3/4" open end wrench on adapter (2) and crescent wrench on gauge fitting, remove adapter from gauge (5).



**Figure 6-17. HPBAC Gauges**

- d. Replacement (Figure 6-17).

**NOTE**

Refer to paragraph 4.5.5 for guidance when applying tape.

- (1) Wrap adapter threads with Teflon® tape and install adapter (2) on gauge (5).
  - (2) Install gauge (5) through front of instrument and control panel.
  - (3) Secure gauge (5) to instrument and control panel with both brackets (4) and nylon nuts (3).
  - (4) Connect adapter (2) to tube connector (1).
  - (5) Install side access panels IAW paragraph 6.3.1.1.b.
  - (6) Perform system pressurization and leak check IAW paragraph 6.2.5.b; remove Out of Service tag.
- e. Perform functional test IAW Table 6-4.

6.3.4.1.2 Oil Pressure Gauge.

- a. Tag out system IAW current shipboard instructions.
- b. Perform system depressurization IAW paragraph 6.2.5.a.

<b>CAUTION</b>
----------------

**To prevent damage to the gauge, use two wrenches when breaking connection and when reconnecting.**

- c. Removal (Figure 6-17).
- (1) Ensure power is OFF.
  - (2) Remove side access panels IAW paragraph 6.3.1.1.a.

**NOTE**

Place clean rags around and below gauge connection to catch any oil that drips when gauge connection is broken.

- (3) Using 9/16" open end wrench on tube connector (1) and 3/4" open end wrench on adapter (2), break connection between tube connector and adapter.

**NOTE**

To maintain cleanliness of air system, cap, plug, or double bag all fittings and connections while performing maintenance (if not replacing immediately).

- (4) Using 3/8" open end wrench, remove both nylon nuts (3) and brackets (4) securing gauge (5) to instrument and control panel.
- (5) Remove gauge (5) from front of instrument and control panel.
- (6) Using 3/4" open end wrench on adapter (2) and one crescent wrench on gauge fitting, remove adapter from gauge (5).

- d. Replacement (Figure 6-17).

**NOTE**

Refer to paragraph 4.5.5 for guidance when applying tape.

- (1) Wrap adapter (2) threads with Teflon® tape and install adapter on gauge (5).
- (2) Install gauge (5) through front of instrument and control panel.
- (3) Secure gauge (5) to instrument and control panel with both brackets (4) and nylon nuts (3).
- (4) Connect adapter (2) to tube connector (1).
- (5) Install side access panel IAW paragraph 6.3.1.1.b.
- (6) Perform system pressurization and leak check IAW paragraph 6.2.5.b; remove Out of Service tag.

- e. Perform functional test IAW Table 6-4.

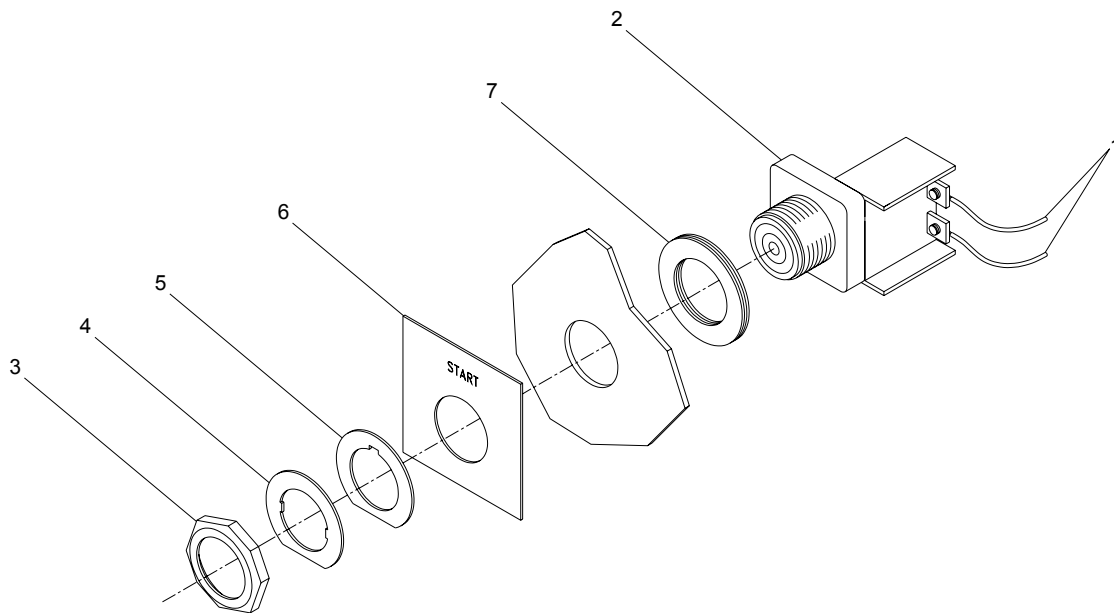
**6.3.4.2 Start Pushbutton Switch.** Corrective maintenance for the Start pushbutton switch is limited to removal and replacement. Callouts refer to Figure 6-18 unless otherwise noted.

<b>WARNING</b>
----------------

**To prevent injury, system must be tagged out prior to performing maintenance.**

- a. Tag out system IAW current shipboard instructions.
- b. Removal (Figure 6-18).
  - (1) Ensure power is OFF.
  - (2) Remove side access panels IAW paragraph 6.3.1.1.a.
  - (3) Label wiring (1) to Start pushbutton switch (2).
  - (4) Using medium flathead screwdriver, disconnect wiring (1) to Start pushbutton switch (2).
  - (5) Using 1-3/8" open end wrench, remove Start pushbutton switch panel nut (3) and washers (4, 5) from front of instrument and control panel.
  - (6) Remove label plate (6) from front of instrument and control panel and Start pushbutton switch (2) from rear of instrument and control panel.
  - (7) Remove rubber (7) spacers from Start pushbutton switch (2).
- c. Replacement (Figure 6-18).
  - (1) Install rubber spacers (7) on Start pushbutton switch (2).
  - (2) Insert Start pushbutton switch (2) through rear of instrument and control panel.
  - (3) Install label plate (6), metal washer (5), and plastic washer (4), ensuring key aligns with keyway on switch, plastic washer, and label plate.
  - (4) Secure with panel nut (3).

- (5) Reconnect wiring (1) to Start pushbutton switch (2) IAW labeling and Figure 5-3.
  - (6) Install side access panels IAW paragraph 6.3.1.1.b; remove Out of Service tag.
- d. Perform functional test IAW Table 6-4.



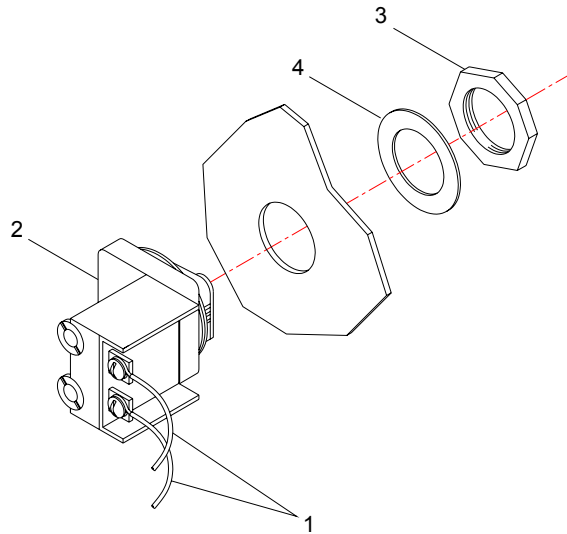
**Figure 6-18. Start Pushbutton Switch**

**6.3.4.3 Power ON/OFF Selector Switch.** Corrective maintenance for the Power ON/OFF selector switch is limited to removal and replacement. Callouts refer to Figure 6-19 unless otherwise noted.

<b>WARNING</b>
----------------

**To prevent injury, system must be tagged out prior to performing maintenance.**

- a. Tag out system IAW current shipboard instructions.
- b. Removal (Figure 6-19).
  - (1) Ensure power is OFF.
  - (2) Remove side access panels IAW paragraph 6.3.1.1.a.
  - (3) Label wiring (1) to Power ON/OFF selector switch (2).
  - (4) Using medium flathead screwdriver, disconnect wiring (1) to Power ON/OFF selector switch (2).
  - (5) Using 1-3/8" open end wrench, remove Power ON/OFF selector switch panel nut (3) and washer (4) from front of instrument and control panel, and remove Power ON/OFF selector switch (2) from rear of instrument and control panel.



**Figure 6-19. Power ON/OFF Selector Switch**

- c. Replacement (Figure 6-19).
  - (1) Insert Power ON/OFF selector switch (2) through rear of panel, ensuring key aligns with keyway on instrument and control panel.
  - (2) Secure with washer (4) and panel nut (3), ensuring key aligns with keyway on switch.
  - (3) Reconnect wiring (1) to Power ON/OFF selector switch (2) IAW labeling and Figure 5-3.
  - (4) Install side access panels IAW paragraph 6.3.1.1.b; remove Out of Service tag.
- d. Perform functional test IAW Table 6-4.



**6.3.4.4 Master ON/OFF Selector Switch.** Corrective maintenance for the Master ON/OFF selector switch is limited to removal and replacement. Callouts refer to Figure 6-20 unless otherwise noted.

<b>WARNING</b>
----------------

**To prevent injury, system must be tagged out prior to performing maintenance.**

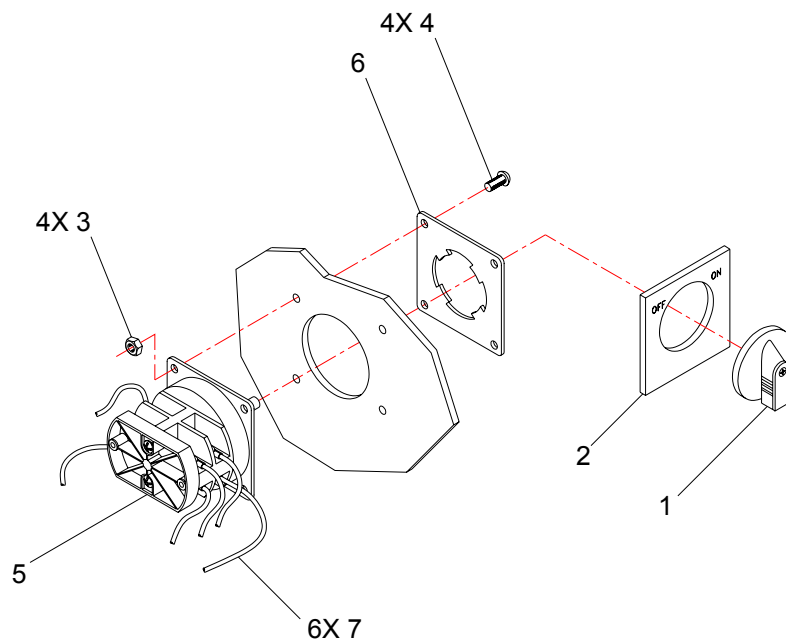
- a. Tag out system IAW current shipboard instructions.
- b. Removal (Figure 6-20).
  - (1) Ensure power is OFF.
  - (2) Remove side access panels IAW paragraph 6.3.1.1.a.
  - (3) Using medium Phillips screwdriver, loosen switch handle retaining screw and remove switch handle (1).
  - (4) Unsnap and remove label plate (2).

**NOTE**

Use retrieval lanyard attached to maintenance personnel's wrist to hold wrench.

- (5) Using 5/16" open end wrench to hold nuts (3) on rear of instrument and control panel and medium Phillips head screwdriver for screws (4) on front, remove all four plate screws and nuts.
- (6) Remove Master ON/OFF selector switch (5) from rear of instrument and control panel, and remove plate (6) from front of instrument and control panel.
- (7) Label all wiring (7) to Master ON/OFF selector switch (5).
- (8) Using medium Phillips head screwdriver, disconnect wiring (7) to Master ON/OFF selector switch (5).

- c. Replacement (Figure 6-20).
- (1) Connect wiring (7) to Master ON/OFF selector switch (5) IAW labeling and Figure 5-3.
  - (2) Install Master ON/OFF selector switch (5) through rear of instrument and control panel, and install plate (6) on front of instrument and control panel.
  - (3) Secure Master ON/OFF selector switch (5) and plate (6) using all four plate screws (4) and nuts (3).
  - (4) Slip label plate (2) over switch and snap into place.
  - (5) Install switch handle (1) and tighten switch handle retaining screw; remove Out of Service tag.
  - (6) Perform functional test IAW Table 6-4.



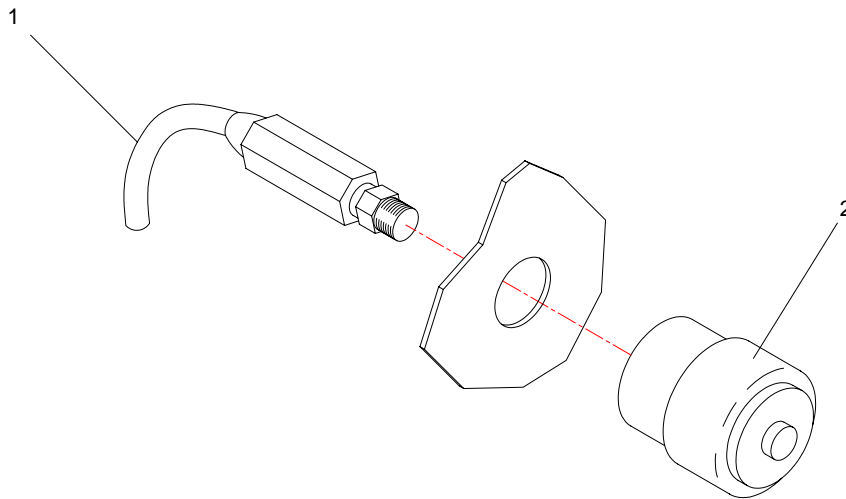
**Figure 6-20. Master ON/OFF Selector Switch**

**6.3.4.5 Inlet Filter Maintenance Indicator.** Corrective maintenance for the inlet filter maintenance indicator is limited to removal and replacement. Callouts refer to Figure 6-21 unless otherwise noted.

<b>WARNING</b>
----------------

**To prevent injury, system must be tagged out prior to performing maintenance.**

- a. Tag out system IAW current shipboard instructions.
- b. Removal (Figure 6-21).
  - (1) Ensure power is OFF.
  - (2) Remove side access panels IAW paragraph 6.3.1.1.a.
  - (3) Using 7/16" open end wrench to hold fitting on maintenance indicator and 9/16" open end wrench to hold intake filter cable, disconnect cable (1) running from intake filter to maintenance indicator (2).
  - (4) Unscrew inlet filter maintenance indicator (2) and remove from front of instrument and control panel.



**Figure 6-21. Inlet Filter Maintenance Indicator**

- c. Replacement (Figure 6-21).

**NOTE**

Refer to paragraph 4.5.5 for guidance when applying tape.

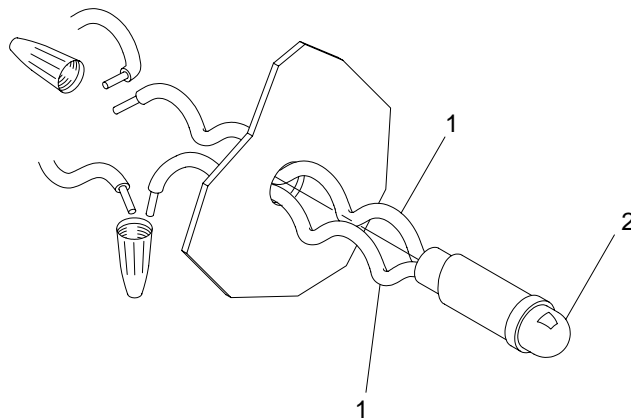
- (1) Wrap threads of inlet filter maintenance indicator fitting with Teflon® tape.
- (2) Install inlet filter maintenance indicator (2) onto fitting.
- (3) Connect cable (1) to inlet filter maintenance indicator.
- (4) Install side access panels IAW paragraph 6.3.1.1.b; remove Out of Service tag.
- (5) Perform functional test IAW Table 6-4.

**6.3.4.6 Indicator Lights.** The three indicator lights that may require removal and replacement are the high air temperature light, the low oil pressure light, and the power on light. Callouts refer to Figure 6-22 unless otherwise noted.

**WARNING**

**To prevent injury, system must be tagged out prior to performing maintenance.**

- a. Tag out system IAW current shipboard instructions.
- b. Removal (Figure 6-22).
  - (1) Ensure power is OFF.
  - (2) Remove side access panels IAW paragraph 6.3.1.1.a.
  - (3) Label and disconnect wiring (1) to indicator light (2).
  - (4) From rear of instrument and control panel, push indicator light (2) through panel, and remove from front.



**Figure 6-22. Indicator Light**

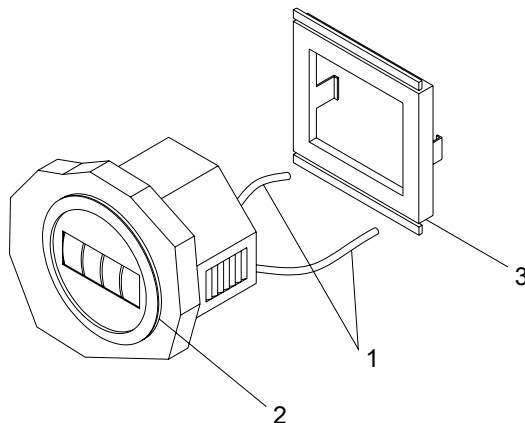
- c. Replacement (Figure 6-22).
  - (1) Insert indicator light (2) through front of instrument and control panel.
  - (2) Reconnect wiring (1) to indicator light (2) IAW labeling and Figure 5-3.
  - (3) Install side access panels IAW paragraph 6.3.1.1.b; remove Out of Service tag.
  - (4) Perform functional test IAW Table 6-4.

**6.3.4.7 Hourmeter.** Corrective maintenance for the hourmeter is limited to removal and replacement. Callouts refer to Figure 6-23 unless otherwise noted. Before removing old hourmeter, note readings in logbook; note readings on new hourmeter in logbook before installation.

<b>WARNING</b>
----------------

**To prevent injury, system must be tagged out prior to performing maintenance.**

- a. Tag out system IAW current shipboard instructions.
- b. Removal (Figure 6-23).
  - (1) Ensure power is OFF.
  - (2) Remove side access panels IAW paragraph 6.3.1.1.a.
  - (3) Label wiring (1) to hourmeter (2).
  - (4) Using small flathead screwdriver, disconnect wiring (1) to hourmeter (2).
  - (5) From rear of panel, spread tabs on both sides of flange (3) securing hourmeter (2) to instrument and control panel; slide flange off rear of hourmeter.
  - (6) Remove hourmeter (2) from front of instrument and control panel.



**Figure 6-23. Hourmeter**

c. Replacement (Figure 6-23).

- (1) Feed cabled wires through flange and front of instrument and control panel.
- (2) Reconnect wiring (1) to hourmeter (2) IAW labeling and Figure 5-3.
- (3) Insert hourmeter (2) through front of instrument and control panel.
- (4) Slide flange (3) over rear of hourmeter (2) until tabs on flange seat in grooves on hourmeter and flange is snug up against rear of instrument and control panel.
- (5) Install side access panels IAW paragraph 6.3.1.1.b; remove Out of Service tag.
- (6) Perform functional test IAW Table 6-4.



**6.3.5 AUTOMATIC CONDENSATE DRAIN (ACD).** Corrective maintenance of the ACD is limited to removal and replacement. Callouts refer to Figure 6-24 unless otherwise noted.

<b>WARNING</b>
----------------

**Do not attempt to remove or disassemble pressurized equipment. Stop all equipment operation and vent pneumatic pressure to atmosphere prior to performing maintenance. Failure to comply can result in injury to personnel.**

**Hazardous voltage can cause severe injury or death. Disconnect all power to the HPBAC and tag out before servicing equipment.**

**HP compressed air may be relieved in one stage and still be contained in another. Ensure that all stages are vented as the sudden release of energy from HP air can create airborne particles that may enter eyes or penetrate skin.**

**To prevent injury, system must be tagged out prior to performing maintenance.**

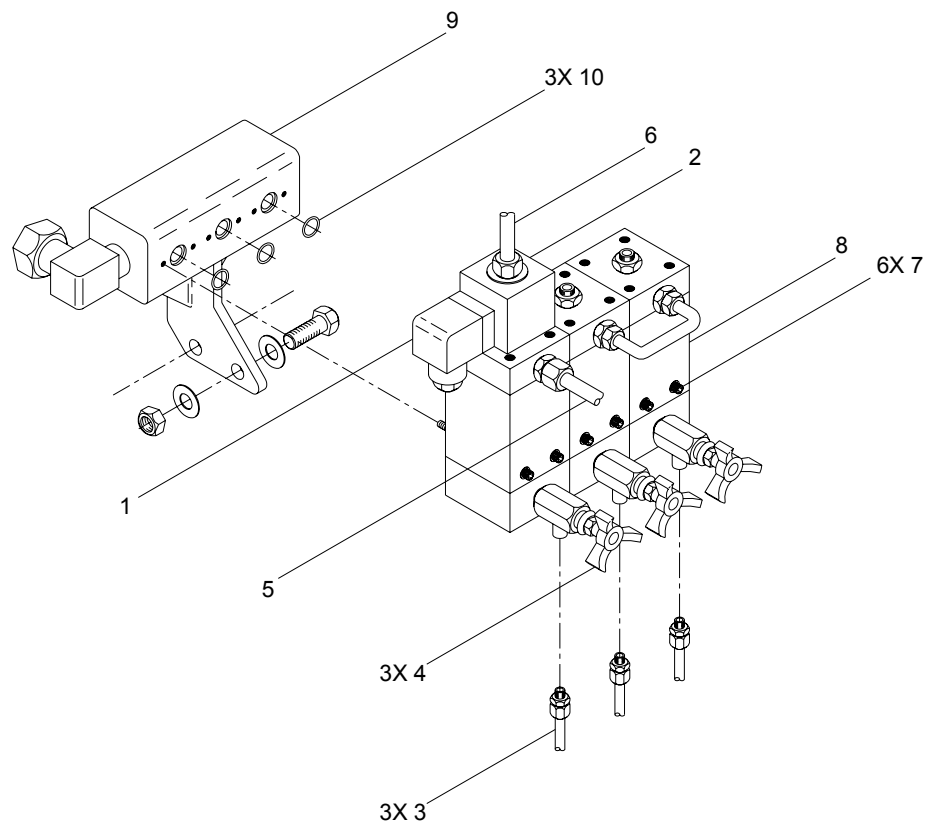
- a. Tag out system IAW current shipboard instructions.
- b. Perform system depressurization IAW paragraph 6.2.5.a.
- c. Removal (Figure 6-24).

**NOTE**

Replace individual valves or complete assembly, as required.

- (1) Remove side access panels IAW paragraph 6.3.1.1.a.
- (2) Remove roof panel IAW paragraph 6.3.1.2.a (if necessary).
- (3) Using small Phillips head screwdriver, disconnect electrical connector (1) from solenoid valve plug (2).

- (4) Using 11/16" open end wrench, disconnect tube fittings (3) from bottom of all three valves (4).
- (5) Using 9/16" open end wrench, disconnect tube fitting (5) from front of valve and disconnect tube fitting (6) from top of valve.
- (6) Using 5mm allen wrench, remove six allen head cap screws (7) securing ACD valve assembly (8) to manifold (9).
- (7) Remove ACD valve assembly (8) from manifold (9).
- (8) Remove O-rings (10) from interface between manifold (9) and ACD assembly (8); cut and discard.



**Figure 6-24. Automatic Condensate Drain (ACD)**

- d. Replacement (Figure 6-24).
  - (1) Lubricate and install new O-rings, P/N N04333, (10) at interface between ACD assembly (8) and manifold (9).
  - (2) Secure ACD assembly (8) to manifold (9) using six allen head cap screws (7).
  - (3) Attach tube fitting (5) to front of valve and tube fitting (6) to top of valve assembly.
  - (4) Connect tube fittings (3) to bottom of all three valves (4).
  - (5) Connect electrical connector (1) to solenoid valve plug (2) and secure with screw.
  - (6) Install side access panels IAW paragraph 6.3.1.1.b.
  - (7) Install roof panel IAW paragraph 6.3.1.2.b; remove Out of Service tag.
  - (8) Perform functional test IAW Table 6-4.
- e. Perform system pressurization and leak check IAW paragraph 6.2.5.b.

**6.3.6 SILENCER/SEPARATOR.** Corrective maintenance of the silencer/separator is limited to removal and replacement of either component. Callouts refer to Figure 6-25 unless otherwise noted.

<b>WARNING</b>
----------------

**To prevent injury, system must be tagged out prior to performing maintenance.**

**NOTE**

The pipe fitting (4) is shown exploded for clarity. It does not come apart during any part of the procedures for the silencer or separator.

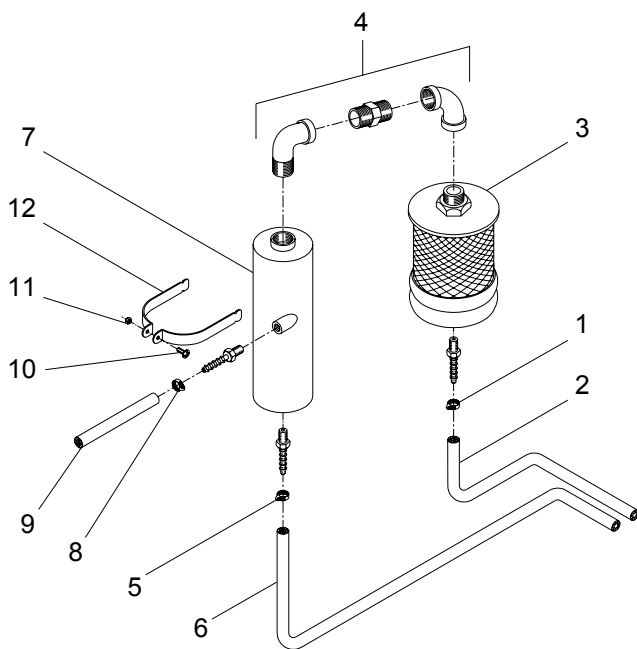
**6.3.6.1 Silencer.**

- a. Tag out system IAW current shipboard instructions.
- b. Removal (Figure 6-25).
  - (1) Remove side access panels IAW paragraph 6.3.1.1.a.
  - (2) Using small flathead screwdriver, loosen clamp (1) on tube (2) attached to bottom of silencer (3) and disconnect tube.
  - (3) Using large crescent wrench, remove silencer (3) from pipe fitting (4).
- c. Replacement (Figure 6-25).

**NOTE**

Refer to paragraph 4.5.5 for guidance when applying tape.

- (1) Wrap threads of silencer (3) with Teflon® tape, and install silencer onto pipe fitting (4).
- (2) Attach tube (2) to bottom of silencer (3) and secure with clamp (1).



**Figure 6-25. Silencer/Separator**

- (3) Install side access panels IAW paragraph 6.3.1.1.b; remove Out of Service tag.
- (4) Perform functional test IAW Table 6-4.
- d. Perform system pressurization and leak check IAW paragraph 6.2.5.b.
- e. Perform air sample test IAW MRC 5519/025 Q-1 (C5DU).

#### **6.3.6.2 Separator.**

- a. Tag out system IAW current shipboard instructions.
- b. Removal (Figure 6-25).
  - (1) Remove side access panels IAW paragraph 6.3.1.1.a.

- (2) Remove silencer IAW paragraph 6.3.6.1.b.
  - (3) Using small flathead screwdriver, loosen clamp (5) on tube (6) attached to bottom of separator (7), and disconnect tube.
  - (4) Using medium flathead screwdriver, loosen clamp (8), and disconnect tube (9).
  - (5) Using large flathead screwdriver for bolt (10) and 9/16" open end wrench for nut (11), loosen unistrut clamp (12) and remove separator (7).
  - (6) Using large crescent wrench, remove pipe fitting (4) from separator (7).
- c. Replacement (Figure 6-25).
- (1) Wrap threads of pipe fitting (4) with Teflon® tape, and install pipe fitting onto separator (7).
  - (2) Secure separator (7) to frame with unistrut clamp (12), bolt (10), and nut (11), ensuring piping angles inward 45 degrees from hose connection.
  - (3) Attach tube (9) to side of separator (7) and secure with clamp (8).
  - (4) Attach tube (6) to bottom of separator (7) and secure with clamp (5).
  - (5) Install silencer IAW paragraph 6.3.6.1.c.
  - (6) Install side access panels IAW paragraph 6.3.1.1.b; remove Out of Service tag.
  - (7) Perform system pressurization and leak check IAW paragraph 6.2.5.b.
- d. Perform functional test IAW Table 6-4.
- e. Perform air sample test IAW MRC 5519/025 Q-1 (C5DU).

<b>WARNING</b>
----------------

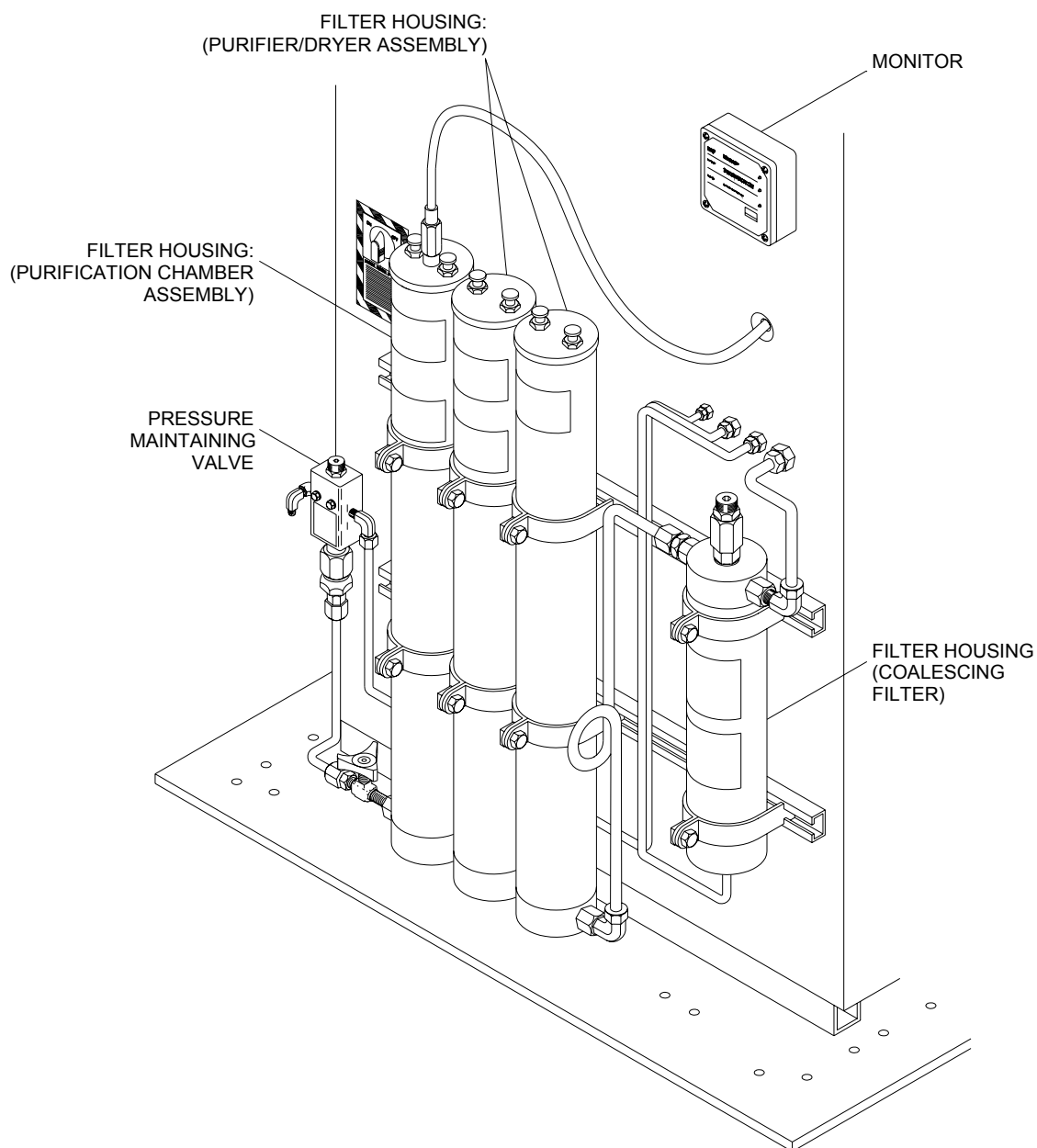
**Do not attempt to remove or disassemble pressurized equipment. Stop all equipment operation and vent pneumatic pressure to atmosphere prior to performing maintenance. Failure to comply can result in injury to personnel.**

**Hazardous voltage can cause severe injury or death. Disconnect all power to the HPBAC and tag out before servicing equipment.**

**HP compressed air may be relieved in one stage and still be contained in another. Ensure that all stages are vented as the sudden release of energy from HP air can create airborne particles that may enter eyes or penetrate skin.**

**6.3.7 AIR PURIFICATION SYSTEM.** Corrective maintenance of the air purification system (Figure 6-26) is limited to the following:

- Paragraph 6.3.7.1 — Removal and replacement of the monitor
- Paragraph 6.3.7.2 — Removal, replacement, and adjustment of the pressure maintaining valve
- Paragraph 6.3.7.3 — Removal and replacement of the filters and housings



**Figure 6-26. Air Purification System**



**6.3.7.1 Securus® Purification Monitor.** Corrective maintenance of the Securus® purification monitor is limited to removal and replacement. Callouts refer to Figure 6-27 unless otherwise noted.

<b>WARNING</b>
----------------

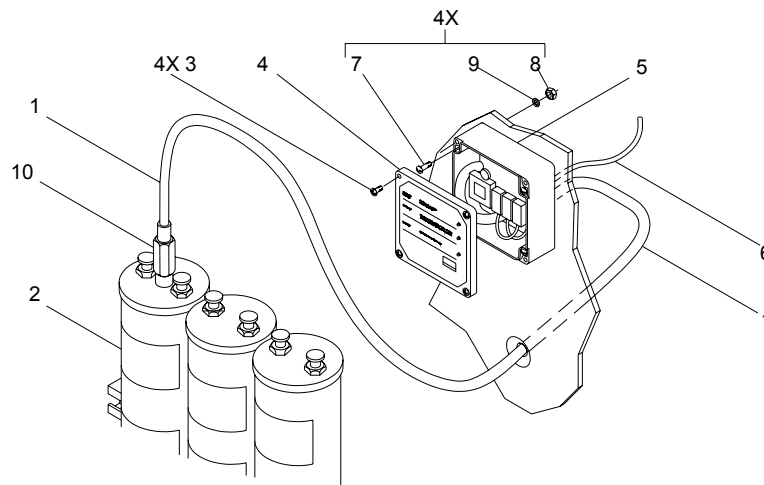
**To prevent injury, system must be tagged out prior to performing maintenance.**

- a. Tag out system IAW current shipboard instructions.
- b. Removal (Figure 6-27).
  - (1) Remove side access panels IAW paragraph 6.3.1.1.a.

**NOTE**

The probe and cable is soldered to the circuit board of the Securus® purification monitor and cannot be removed.

- (2) Disconnect probe and cable (1) from chamber assembly (2), and feed probe and cable through front of instrument and control panel.
- (3) Using small Phillips head screwdriver, loosen all four captive screws (3) securing front panel (4) to monitor (5); remove panel.
- (4) Label all individual wires of the cabled wiring (6) between monitor (5) and compressor.
- (5) Using very small flathead screwdriver, disconnect individual wires of cabled wiring (6) from monitor (5).
- (6) Using small flathead screwdriver and 5/16" socket wrench, remove all four sets of screws (7), nuts (8), and washers (9) securing monitor (5) to instrument and control panel; remove monitor.
- (7) Using 6" crescent wrench, loosen packing nut securing cabled wiring (6) to back of monitor (5), and remove cabled wiring from back of monitor and instrument and control panel.
- (8) Feed probe and cable (1) through rear of instrument and control panel.



**Figure 6-27. Securus® Purification Monitor**

c. Replacement (Figure 6-27).

- (1) Loosen all four captive screws (3) securing front panel (4) of new monitor (5); remove panel.
- (2) Feed monitoring probe lead (10) through front of rectangular opening behind monitor on instrument and control panel.
- (3) Secure monitor (5) to instrument and control panel with all four sets of washers (9), nuts (8), and screws (7).
- (4) Feed wires on cabled wiring (6) through back of monitor (5), and secure cabled wiring to monitor with packing nut.
- (5) Connect individual wires on cabled wiring (6) to monitor (5) IAW labeling.
- (6) Replace front panel (4) of new monitor (5); secure using all four captive screws (3).
- (7) Lead probe and cable (1) back through instrument and control panel, and attach probe lead (10) to chamber assembly (2).
- (8) Install side access panels IAW paragraph 6.3.1.1.b; remove Out of Service tag.

d. Perform functional test IAW Table 6-4.

**6.3.7.2 Pressure Maintaining Valve (PMV).** Corrective maintenance of the PMV is limited to removal, replacement, and adjustment. Callouts refer to Figures 6-28 and 6-29 unless otherwise noted.

<b>WARNING</b>
----------------

**To prevent injury, system must be tagged out prior to performing maintenance.**

- a. Tag out system IAW current shipboard instructions.
- b. Perform system depressurization IAW paragraph 6.2.5.a.
- c. Removal (Figure 6-28).

**NOTE**

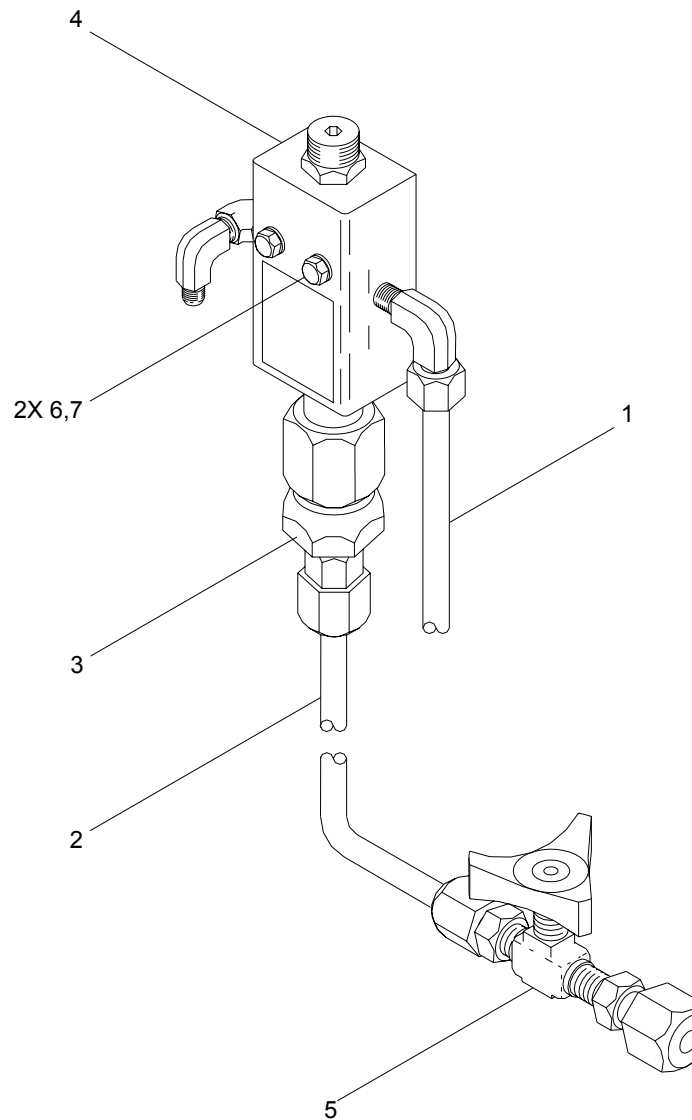
To maintain cleanliness of air system, cap, plug, or double bag all fittings and connections while performing maintenance (if not replacing immediately).

- (1) Using 9/16" open end wrench, disconnect tube assembly (1).
- (2) Using 3/4" open end wrench, disconnect tube assembly (2) from check valve (3) on PMV (4) and from manual bleed valve (5).

**NOTE**

Use retrieval lanyard attached to maintenance personnel's wrist to hold 7/16" open end wrench.

- (3) Using 7/16" socket wrench for bolts and 7/16" open end wrench for nuts, remove both sets of hex bolts (6) and nuts (7) securing PMV (4) to instrument and control panel.
- (4) Using 10" crescent wrench, disconnect check valve (3) from PMV (4).



**Figure 6-28. Pressure Maintaining Valve (PMV)**

d. Replacement (Figure 6-28).

(1) Remove elbow fittings and check valve (3) from old PMV (4).

**NOTE**

Refer to paragraph 4.5.5 for guidance when applying tape.

- (2) Apply Teflon® tape to threads of elbow fittings and install on new PMV (4).
- (3) Apply Teflon® tape to threads of check valve (3); install check valve (3) on PMV (4).

**NOTE**

Use retrieval lanyard attached to maintenance personnel's wrist to hold 7/16" open end wrench.

- (4) Secure PMV (4) to instrument and control panel using hex bolts (6) and nuts (7).
  - (5) Attach tube assemblies (1, 2).
  - (6) Attach tube assembly (2) to manual bleed valve (5); remove Out of Service tag.
- e. Perform system pressurization and leak check IAW paragraph 6.2.5.b.
  - f. Perform functional test IAW Table 6-4.
  - g. Perform air sample test IAW MRC 5519/025 Q-1 (C5DU).
  - h. Adjustment (Figure 6-29). The PMV is adjusted at the factory to the required pressure and does not normally require maintenance or readjustment. However, if readjustment becomes necessary, follow these steps:
    - (1) Using 7/8" open end wrench, loosen locking ring (1).

**NOTE**

Turn adjusting screw clockwise to increase pressure or counterclockwise to decrease pressure.

- (2) Using 5/16" allen wrench, set adjusting screw (2) to required position.

- (3) Hold adjusting screw with 5/16" allen wrench, and tighten locking ring (1).
- (4) Test PMV for proper adjustment as follows:

<b>WARNING</b>
----------------

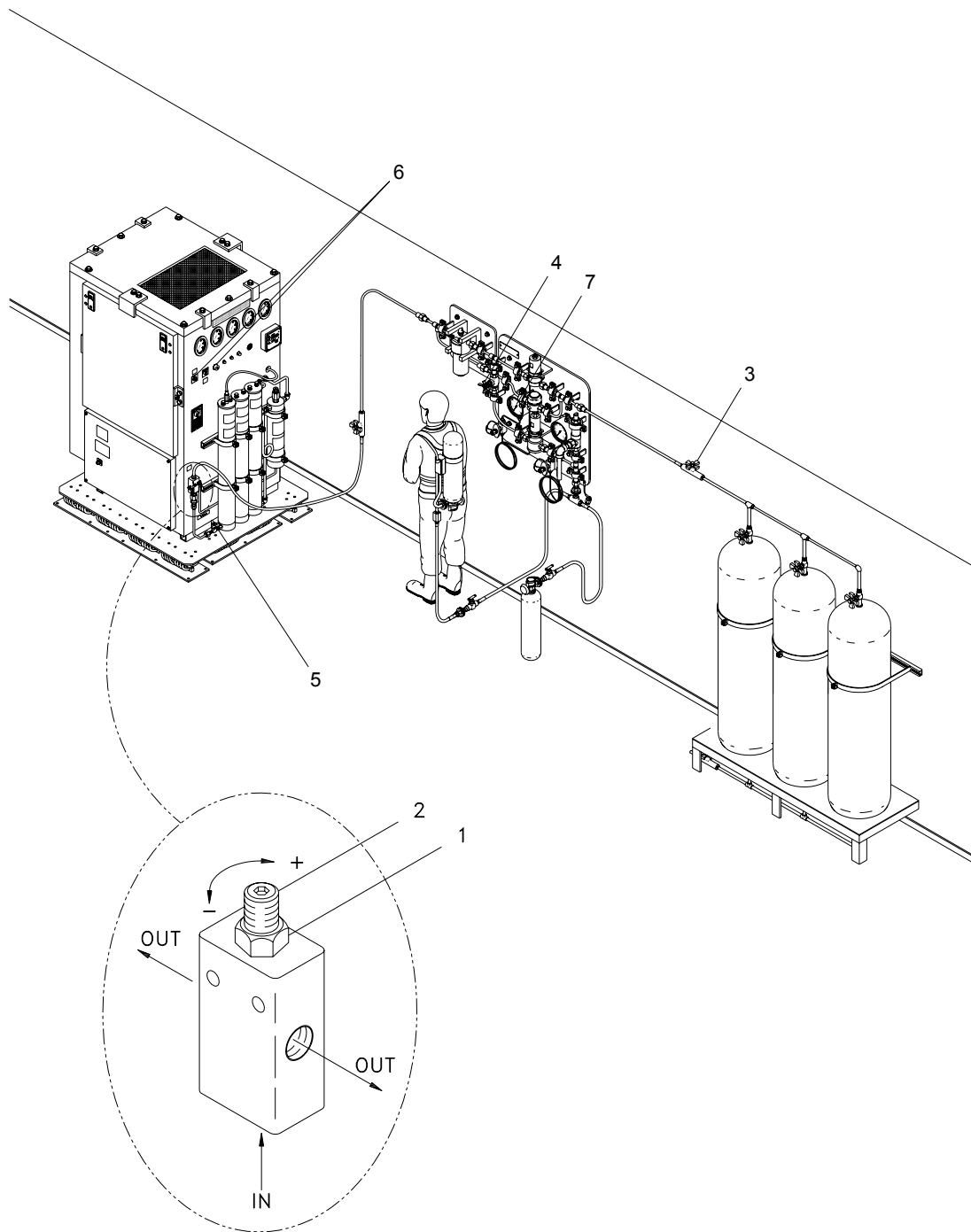
**Before opening bleed valves, ensure all personnel stand clear of area to avoid injury from flying debris. Operator shall announce *Bleeding down* to warn nearby personnel. Operator must wear protective eyewear and hearing protection to prevent personal injury.**

- (a) Ensure stowage flask isolation valve (3) is closed.
- (b) Open stop valve (AHP-V103) (4) located on charging panel.
- (c) Depressurize oil and water separator and purification chambers by slowly opening manual bleed valve (5) located adjacent to purification chambers.
- (d) Close manual bleed valve (5); start compressor (6).

**NOTE**

During check, pressure is discharged from the control valve when the valve opens; the releasing air will be audible when the valve opens.

- (e) Observe fourth stage pressure gauge (7) on instrument and control panel and note pressure at which AHP-G101 on charging panel begins to read pressure. Fourth stage pressure gauge reading indicates pressure at which PMV opened (delivered). If pressure is not within the range of  $2,175 \pm 200$  psi, adjust IAW steps 1 - 3.



**Figure 6-29. Pressure Maintaining Valve (PMV) Adjustment**

**6.3.7.3 Filters and Housings.** Corrective maintenance of the filters and housings is limited to the following removal and replacement procedures:

- Paragraph 6.3.7.3.1 — Coalescing Filter
- Paragraph 6.3.7.3.2 — Purifier/Dryer Assembly

**6.3.7.3.1 Coalescing Filter.** Corrective maintenance for the coalescing filter is limited to removal and replacement. Callouts refer to Figure 6-30 unless otherwise noted.

<b>WARNING</b>
----------------

**To prevent injury, system must be tagged out prior to performing maintenance.**

- a. Tag out system IAW current shipboard instructions.
- b. System Depressurization.
  - (1) Perform system depressurization IAW paragraph 6.2.5.a, steps 1 through 3.
  - (2) Ensure stop valve AHP-V103 (on SCBA panel) is open.
  - (3) Continue to bleed system pressure IAW paragraph 6.2.5.a, steps 5 through 9.
- c. Removal (Figure 6-30).

**NOTE**

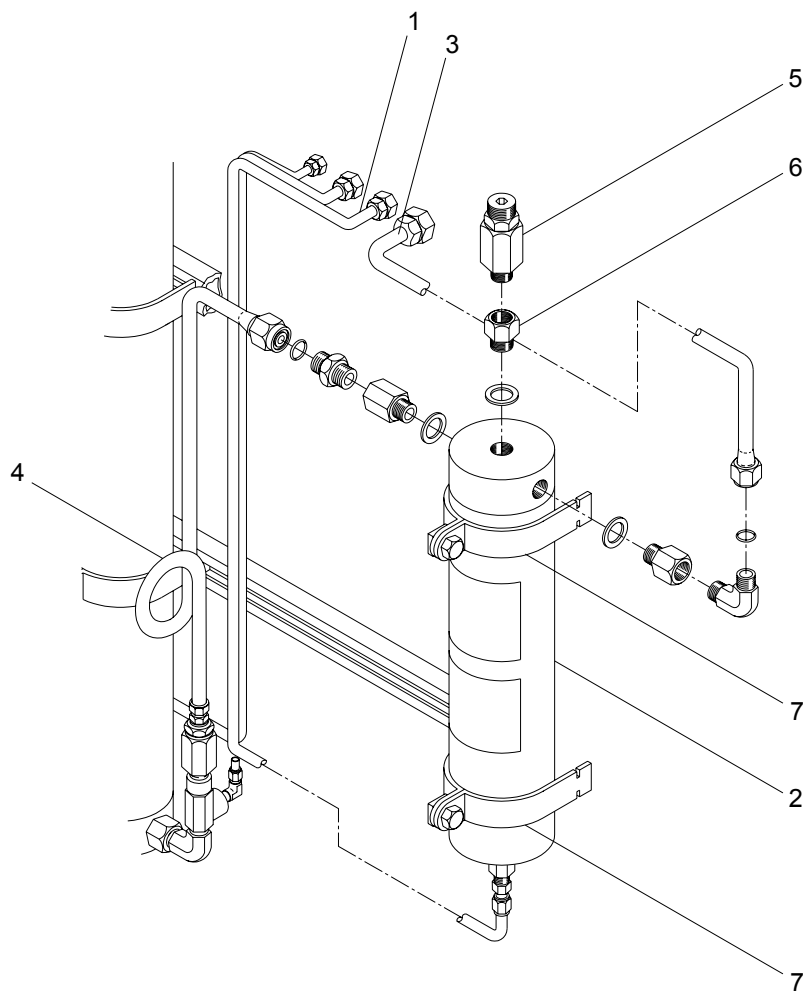
To maintain cleanliness of air system, cap, plug, or double bag all fittings and connections while performing maintenance (if not replacing immediately).

Crush washer/gasket fitting, P/N N04499, on relief valve must be replaced when removing fittings.

- (1) Using 9/16" open end wrench, disconnect and remove tube assembly (1) from bottom of coalescing filter (2) and from instrument and control panel.



- (2) Using 11/16" open end wrench, disconnect and remove tube assemblies (3, 4) from coalescing filter (2).
  - (3) Using 7/8" open end wrench, disconnect relief valve (5) and adapter (6); remove relief valve and adapter as a unit, and remove gasket.
  - (4) Using 7/8" open end wrench, remove fittings from sides of filter (2); remove gaskets.
  - (5) Using Bauer tool, P/N WRH-0005, and 3/4" open end wrench, disconnect and remove fitting from bottom of filter (2).
  - (6) Using 5/8" open end wrench to hold nuts and large flathead screwdriver for bolts, remove unistrut clamps (7) attaching filter (2) to frame; remove and discard filter.
- d. Replacement (Figure 6-30).
- (1) Install fittings and new gaskets onto new filter (2).
  - (2) Secure new filter (2) to frame with unistrut clamps (7).
  - (3) Install adapter (6) and relief valve (5) with gasket onto filter (2).
  - (4) Reattach tube assemblies (1, 3, 4) to filter (2), and reattach tube assembly (1) to instrument and control panel; remove Out of Service tag.
- e. Perform system pressurization and leak check IAW paragraph 6.2.5.b.
- f. Perform functional test IAW Table 6-4.
- g. Perform air sample test IAW MRC 5519/025 Q-1 (C5DU).



**Figure 6-30. Coalescing Filter**

6.3.7.3.2 Purifier/Dryer Assembly. Corrective maintenance of the purifier/dryer assembly is limited to removal and replacement of any or all chambers. Callouts refer to Figure 6-31 unless otherwise noted.

<b>WARNING</b>
----------------

**To prevent injury, system must be tagged out prior to performing maintenance.**

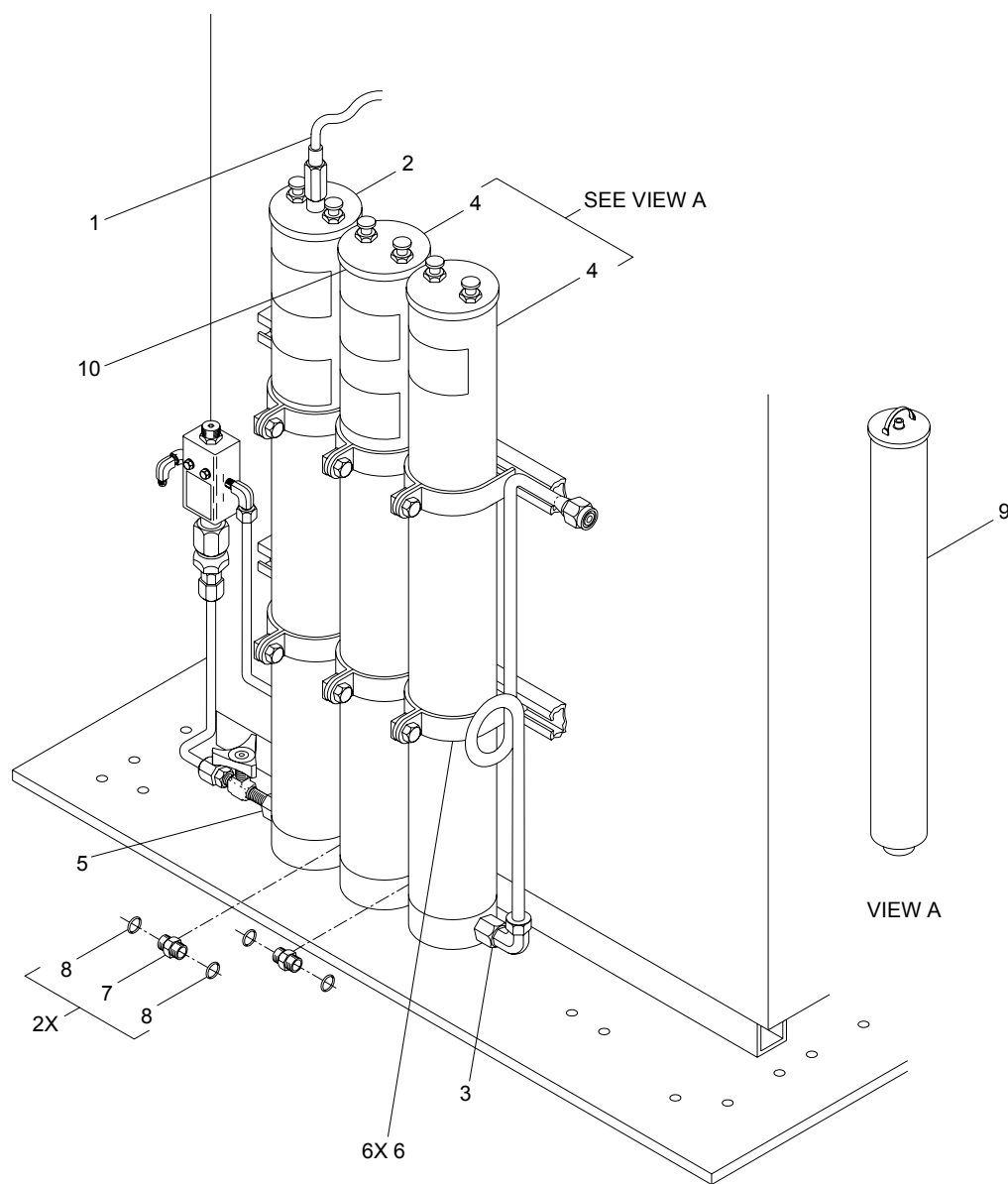
- a. Tag out system IAW current shipboard instructions.
- b. Perform system depressurization IAW paragraph 6.2.5.a.
- c. Removal (Figure 6-31).

**NOTE**

To maintain cleanliness of air system, cap, plug, or double bag all fittings and connections while performing maintenance (if not replacing immediately).

If center chamber is to be removed, right or left chamber must be removed to allow access.

- (1) Disconnect probe and cable assembly (1) from purification chamber (2); inspect cable, probe, and socket for evidence of fraying or bad connections.
- (2) Disconnect tube assembly (3) from purifier/dryer assembly (4) or tube assembly (5) from purification chamber (2) as necessary.
- (3) Using 5/8" open end wrench and large flathead screwdriver, loosen unistrut clamps (6) on chamber to be replaced.
- (4) Using Bauer tool and strap wrench, disconnect chamber from base and remove chamber.
- (5) Unscrew base from fitting (7) attaching base of chamber being removed to base of adjacent chamber.



**Figure 6-31. Purifier/Dryer Assembly**

- (6) Disconnect fitting (7) from adjacent base; cut and discard O-rings (8).
- (7) Remove filter (9) from chamber; discard filter and chamber.
- d. Replacement (Figure 6-31).
  - (1) Apply a thin coat of silicone lubricant to O-ring (8) and install on fitting (7) between connector and stationary chamber next to which new chamber will be mounted.
  - (2) Apply a thin coat of silicone lubricant to O-ring (8) and install on open end of fitting (7).
  - (3) Screw base onto open end of fitting (7) and tighten union connector.
  - (4) Screw chamber onto base.
  - (5) Secure new chamber to frame with unistrut clamps (6).
  - (6) Using Bauer tool and strap wrench, remove cover (10) from new chamber.
  - (7) Install new filter cartridge (9) in new chamber, ensuring cartridge seats properly; replace cover (10).
  - (8) Reconnect tube assemblies (3, 5) as necessary, and reattach probe and cable assembly (1); remove Out of Service tag.
- e. Perform system pressurization and leak check IAW paragraph 6.2.5.b.
- f. Perform functional test IAW Table 6-4.
- g. Perform air sample test IAW MRC 5519/025 Q-1 (C5DU).

**6.3.8 COMPRESSOR BLOCK ASSEMBLY.** Corrective maintenance of the compressor block assembly is limited to the following:

- Paragraph 6.3.8.1 — Compressor Block Removal and Replacement
- Paragraph 6.3.8.2 — Pressure Cut-Out Switches Removal, Replacement, and Adjustment
- Paragraph 6.3.8.3 — Oil Pressure Regulator Removal, Replacement, and Adjustment

**6.3.8.1 Compressor Block.** Corrective maintenance of the compressor block is limited to removal and replacement. Callouts refer to Figures 6-32 and 6-33 unless otherwise noted.

<b>WARNING</b>
----------------

**High Pressure (HP) compressed air may be relieved in one stage and still be contained in another. Ensure that all stages are vented as the sudden release of energy from HP air can create airborne particles that may enter eyes or penetrate skin.**

**To prevent injury, system must be tagged out prior to performing maintenance.**

- a. Tag out system IAW current shipboard instructions.
- b. Perform system depressurization IAW paragraph 6.2.5.a.
- c. Removal (Figures 6-32 and 6-33).
  - (1) Remove side access panels IAW paragraph 6.3.1.1.a.
  - (2) Remove roof panel IAW paragraph 6.3.1.2.a.
  - (3) Remove rear access panel IAW paragraph 6.3.1.3.a.
  - (4) Remove belt guard panel IAW paragraph 6.3.1.4.a.
  - (5) Remove drive V-belt IAW paragraph 6.3.2.1.b.
  - (6) Remove cooling air plenum (1, Figure 6-32) by removing all six hex-head bolts (2), washers (3), and nuts (4) securing it to rear panel.

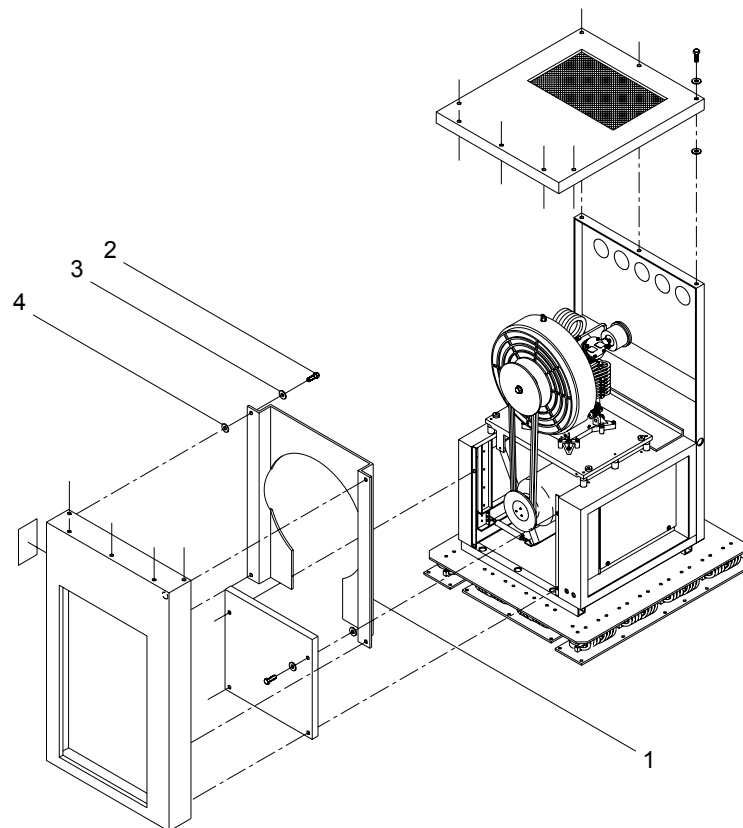
- (7) Label and disconnect all wiring to compressor block.
- (8) Label and disconnect all tubing to compressor block.
- (9) Remove clamp (1, Figure 6-33) and shim plate (2) sets from all four corners of compressor block by removing hex-head bolts (3), washers (4), and nuts (5).

<b>CAUTION</b>
----------------

**A hoist or other lifting device capable of handling 500 pounds (227 kg) is required for removal of the compressor block. Handle equipment properly to prevent damage.**

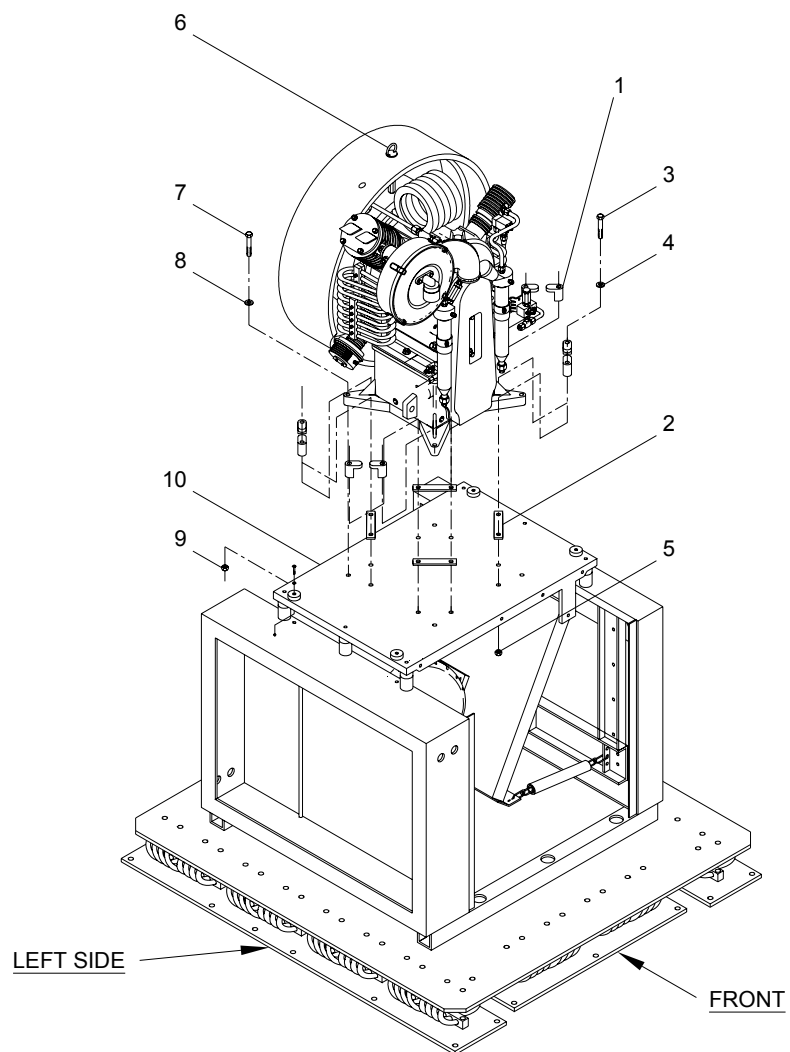
- (10) Attach hoist to eyebolt (6).
  - (11) Remove all four sets of mounting bolts (7), washers (8), and nuts (9) that secure compressor block to base plate (10).
  - (12) Using hoist, raise compressor block clear of frame.
- d. Replacement (Figures 6-32 and 6-33).
- (1) Hoist compressor block into place.
  - (2) Attach all four mounting bolts (7) in corners of frame; secure with washers (8) and nuts (9) to base plate (10).
  - (3) Attach clamp and shim plate sets (2) on all four corners of compressor block and secure with hex-head bolts (3), washers (4), and nuts (5).
  - (4) Reconnect tubing IAW labeling and Figure 5-1.
  - (5) Reconnect wiring IAW labeling and Figure 5-3.
  - (6) Replace cooling air plenum (1, Figure 6-32); secure to rear panel with hex-head bolts (2), washers (3), and nuts (4).
  - (7) Attach drive V-belts IAW paragraph 6.3.2.1.c.
  - (8) Using 3-foot straight edge, check alignment of drive motor pulley and compressor flywheel pulley by placing straight edge across compressor flywheel and drive motor pulley to verify alignment; adjust alignment by moving sheave on drive motor.

- (9) Install belt guard panel IAW paragraph 6.3.1.4.b.
  - (10) Install rear access panel IAW paragraph 6.3.1.3.b.
  - (11) Install roof panel IAW paragraph 6.3.1.2.b.
  - (12) Install side access panels IAW paragraph 6.3.1.1.b.
- e. Perform system pressurization and leak check IAW paragraph 6.2.5.b.



**Figure 6-32. Accessing Compressor Block**





**Figure 6-33. Compressor Block Removal**

**6.3.8.2 Pressure Cut-Out Switches (1PS Air and 2PS Oil).** Corrective maintenance of the Air Pressure Cut-Out Switch (labeled 1PS on the compressor block) is limited to removal, replacement, and adjustment. Corrective maintenance of the Oil Pressure Cut-Out Switch (labeled 2PS on the compressor block) is limited to removal and replacement. Callouts refer to Figure 6-34 unless otherwise noted.

<b>WARNING</b>
----------------

**To prevent injury, system must be tagged out prior to performing maintenance.**

**NOTE**

The procedure for removal and replacement of the Oil Pressure Switch (2PS) is identical to the Air Pressure Cut-Out Switch (1PS) except that clean, lint free rags must be placed around and underneath the 2PS to catch any dripping oil.

- a. Tag out system IAW current shipboard instructions.
- b. Perform system depressurization IAW paragraph 6.2.5.a.
- c. Removal (Figure 6-34).
  - (1) Remove side access panels IAW paragraph 6.3.1.1.a.
  - (2) From electrical panel side (underneath), label and disconnect wiring (1) to switch (2).

**NOTE**

Disconnecting the tubing from the top of 2PS will vent the system. Place clean, lint free rags around and under connection to catch any dripping oil.

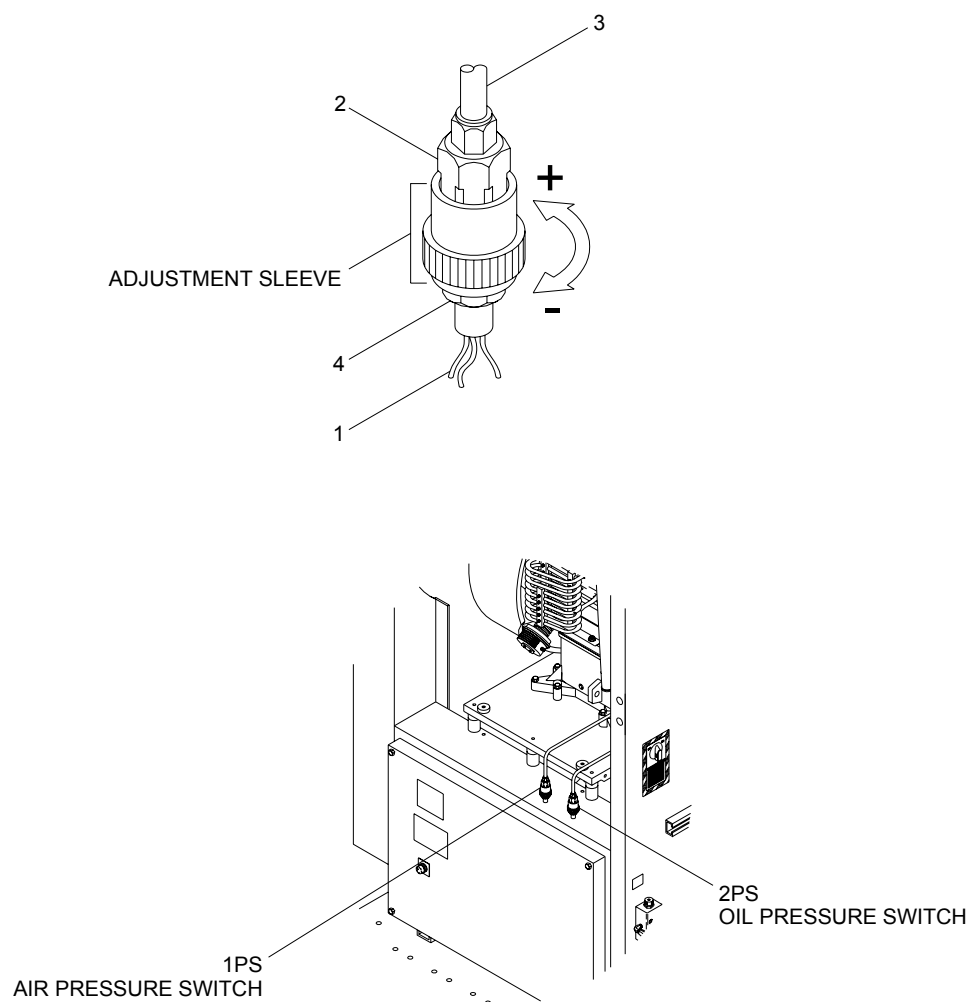
- (3) Using 9/16" open end wrench, disconnect tubing (3) from top of switch (2).
- (4) Using 1" open end wrench, remove panel nut (4) securing switch (2) to frame.

- d. Replacement (Figure 6-34).
  - (1) Thread switch (2) into frame and secure with panel nut (4).
  - (2) Reconnect wiring (1) IAW labeling and Figure 5-3.
  - (3) Connect tubing (3) to top of switch (2).
  - (4) Install side access panels IAW paragraph 6.3.1.1.b; remove Out of Service tag.
- e. Perform system pressurization and leak check IAW paragraph 6.2.5.b.
- f. Perform functional test IAW Table 6-4.
- g. Perform air sample test IAW MRC 5519/025 Q-1 (C5DU).

6.3.8.2.1 Air Pressure Switch (1PS) Adjustment. Set point for the air pressure switch, located as shown in Figure 6-34, is  $5000 \pm 100$  psi.

- a. Tag out system IAW current shipboard instructions.
- b. Remove side access panels IAW paragraph 6.3.1.1.a.
- c. Note orientation of switch.
- d. Hand-turn adjustment sleeve clockwise to decrease set point or counterclockwise to increase set point.
- e. Perform functional test IAW Table 6-4.
- f. Install side access panels IAW paragraph 6.3.1.1.b; remove Out of Service tag.

6.3.8.2.2 Oil Pressure Switch Testing and Adjustment. Set point for the oil pressure switch is 800-920 psi. There is no adjustment for this switch.



**Figure 6-34. Pressure Cut-Out Switches (1PS Air, 2PS Oil)**

**6.3.8.3 Oil Pressure Regulator.** Maintenance of the oil pressure regulator includes removal and replacement of the oil pressure regulator, adjustment of the regulator, and venting the oil pump. Figures 6-35 and 6-36 are referenced as indicated in this procedure.

**6.3.8.3.1 Oil Pressure Regulator Removal and Replacement** (Figure 6-35).

<b>WARNING</b>
----------------

**To prevent injury, system must be tagged out prior to performing maintenance.**

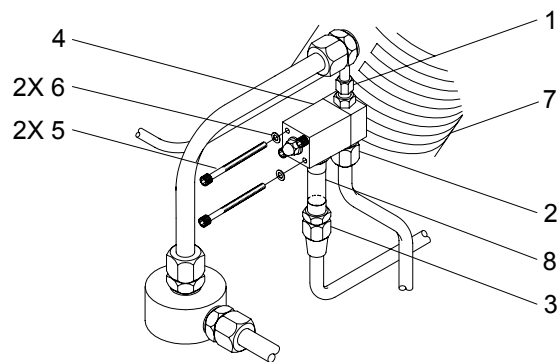
- a. Tag out system prior to performing maintenance.
- b. Removal (Figure 6-35).
  - (1) Using 9/16" open end wrench, disconnect all three tubes (1, 2, 3) connected to oil pressure regulator (4).

**NOTE**

The upper right and lower left hex-head retaining screws must remain in place to hold the regulator body together.

- (2) Using 5mm allen wrench, remove only upper left and lower right hex-head screws (5) and washers (6) securing oil pressure regulator (4) to 4th stage cylinder (7) (upper right and lower left screws hold regulator body together); remove oil pressure regulator.
  - (3) Remove O-ring from seal between oil pressure regulator (4) and 4th stage cylinder (7); cut and discard O-ring.
- c. Replacement (Figure 6-35).
  - (1) Lubricate and install new O-ring, P/N N07091, between oil pressure regulator (4) and 4th stage cylinder (7).
  - (2) Install oil pressure regulator (4) on 4th stage cylinder (7), and secure using both sets of washers (6) and hex-head cap screws (5).

- (3) Reconnect tubing (1, 2, 3).
  - (4) Pressurize system IAW paragraph 6.2.5.b.
  - (5) Check oil sight glass (8) for bubbles; if bubbles are present, vent oil pump IAW paragraph 6.3.8.3.3.
  - (6) Adjust oil pressure regulator IAW paragraph 6.3.8.3.2; remove Out of Service tag.
- d. Perform functional test IAW Table 6-4.
- e. Perform air sample test IAW MRC 5519/025 Q-1 (C5DU).



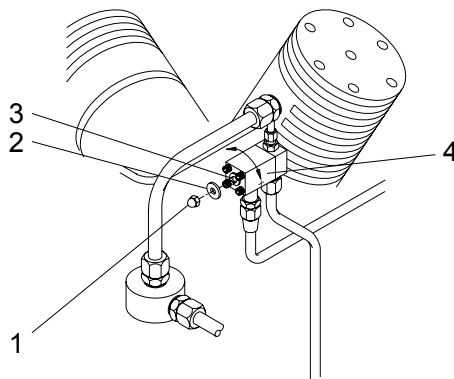
**Figure 6-35. Oil Pressure Regulator**

6.3.8.3.2 Oil Pressure Regulator Adjustment. The oil pressure regulator is mounted on the 4th stage cylinder and is adjusted to 870 +50/-70 psi IAW the following procedure. Callouts refer to Figure 6-36 unless otherwise noted.

#### NOTE

The unit must be operating for the following procedure.

- a. Start compressor IAW standard operating procedures.
- b. Read oil pressure on gauge in instrument panel; determine if pressure needs to be increased or decreased.
- c. Using 13mm socket wrench, remove cap nut (1) and washer (2).
- d. Using medium flathead screwdriver, turn set screw (3) in oil pressure regulator block (4) to adjust pressure. Clockwise increases pressure; counterclockwise reduces pressure.
- e. Install washer (2) and cap nut (1).



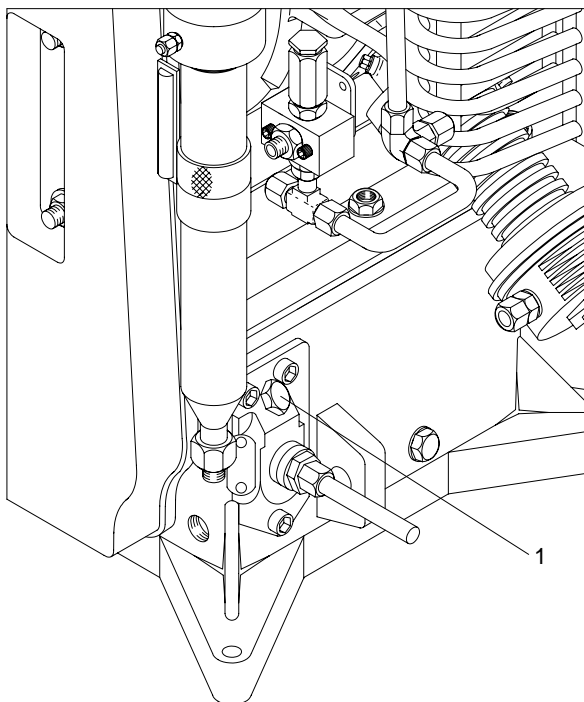
**Figure 6-36. Oil Pressure Regulator Adjustment**

6.3.8.3.3 Venting the Oil Pump. Vent the oil pump IAW the following procedure. Callouts refer to Figure 6-37.

**WARNING**

**To prevent injury, system must be tagged out prior to performing maintenance.**

- a. Tag out system prior to performing maintenance.
- b. Using 11/16" open end wrench, loosen plug (1) approximately 2 – 3 turns.
- c. Turn compressor by hand to free air bubbles.
- d. Tighten plug (1); remove Out of Service tag.



**Figure 6-37. Venting the Oil Pump**



**6.3.9 DRIVE MOTOR/CABLE ASSEMBLY.** Corrective maintenance for the drive motor/cable assembly is outlined below. Callouts refer to Figure 6-38 unless otherwise noted.

<b>WARNING</b>
----------------

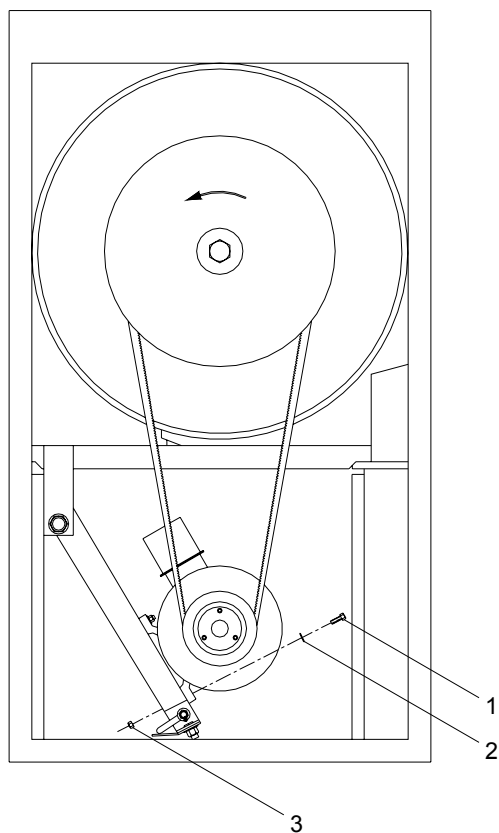
**Hazardous voltage can cause severe injury or death. Disconnect all power to the HPBAC and tag out before servicing equipment.**

- a. Tag out system IAW current shipboard instructions.
- b. Perform system depressurization IAW paragraph 6.2.5.a.
- c. Removal (Figure 6-38).

<b>CAUTION</b>
----------------

**Before loosening the drive motor assembly attaching hardware, ensure that a hoist or other lifting device is in place that will support the motor's weight of approximately 165 lbs (75 kg). Handle equipment properly to prevent damage.**

- (1) Remove rear access panel IAW paragraph 6.3.1.3.a.
- (2) Remove belt guard panel IAW paragraph 6.3.1.4.a.
- (3) Remove drive V-belts IAW paragraph 6.3.2.1.b.
- (4) Label and disconnect wiring to motor.
- (5) Attach hoist to motor.
- (6) Remove motor by removing the four sets of bolts (1), washers (2), and nuts (3) securing it to motor mounting plate.



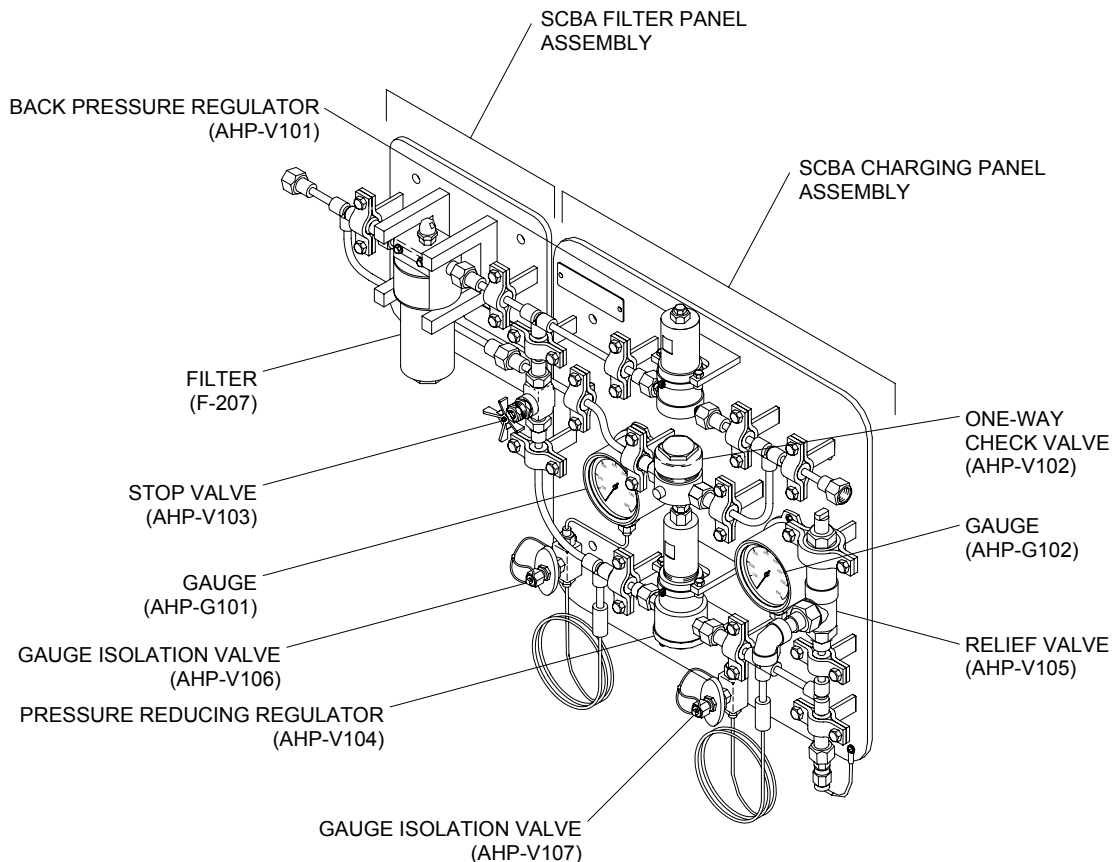
**Figure 6-38. Drive Motor**

- d. Replacement (Figure 6-38).
  - (1) Secure motor to motor mounting plate using the four sets of bolts (1), washers (2), and nuts (3).
  - (2) Reconnect wiring IAW labeling and Figure 5-3.
  - (3) Replace drive V-belts IAW paragraph 6.3.2.1.c.
  - (4) Using 3-foot straight edge, check alignment of drive motor pulley and compressor flywheel pulley by placing straight edge across compressor flywheel and drive motor pulley to verify alignment; adjust alignment by moving sheave on drive motor.
  - (5) Install belt guard panel IAW paragraph 6.3.1.4.b.
- e. Check for proper rotation of drive motor IAW the following:
  - (1) Start up compressor IAW standard operating procedures.
  - (2) Ensure flywheel turns in counterclockwise direction as shown in Figure 6-38. If rotation is incorrect, refer to troubleshooting procedures in Table 5-1.
  - (3) Return equipment to readiness condition.
- f. Install rear access panel IAW paragraph 6.3.1.3.b; remove Out of Service tag.
- g. Perform functional test IAW paragraph Table 6-4.

## 6.4 SCBA FILTER PANEL AND CHARGING PANEL REPAIR.

Corrective maintenance of the SCBA Filter and Charging Panels (Figure 6-39) consists of removing and replacing the following components:

- Paragraph 6.4.1 — SCBA Filter (F-207)
- Paragraph 6.4.2 — Back Pressure Regulator (AHP-V101)
- Paragraph 6.4.3 — One-Way Check Valve (AHP-V102)
- Paragraph 6.4.4 — Stop Valve (AHP-V103)
- Paragraph 6.4.5 — Pressure Reducing Regulator (AHP-V104)
- Paragraph 6.4.6 — Relief Valve (AHP-V105)
- Paragraph 6.4.7 — Gauge Isolation Valves (AHP-V106 and AHP-V107)
- Paragraph 6.4.8 — Gauges (AHP-G101 and AHP-G102)



**Figure 6-39. SCBA Filter Panel and Charging Panel Components**

<b>WARNING</b>
----------------

**Do not loosen or tighten fittings while system is under pressure. Failure to comply could result in death or injury to personnel and damage to equipment.**

**HP compressed air may be relieved in one stage and still be contained in another. Ensure that all stages are vented as the sudden release of energy from HP air can create airborne particles that may enter eyes or penetrate skin.**

**Hazardous voltage can cause severe injury or death. Disconnect all power to the HPBAC and tag out before servicing equipment.**

**High surface temperatures of the Compressor and Drive Motor can cause burns. Allow the unit to cool before servicing.**

**NOTE**

When performing maintenance on the SCBA Filter Panel, SCBA Charging Panel, and their sub-components, observe the general maintenance instructions outlined in paragraph 4.5.

**6.4.1 SCBA FILTER (F-207).** Corrective maintenance for SCBA filter (F-207) is limited to removal and replacement of the filter. Callouts refer to Figure 6-40 unless otherwise noted.

<b>WARNING</b>
----------------

**To prevent injury, system must be tagged out prior to performing maintenance.**

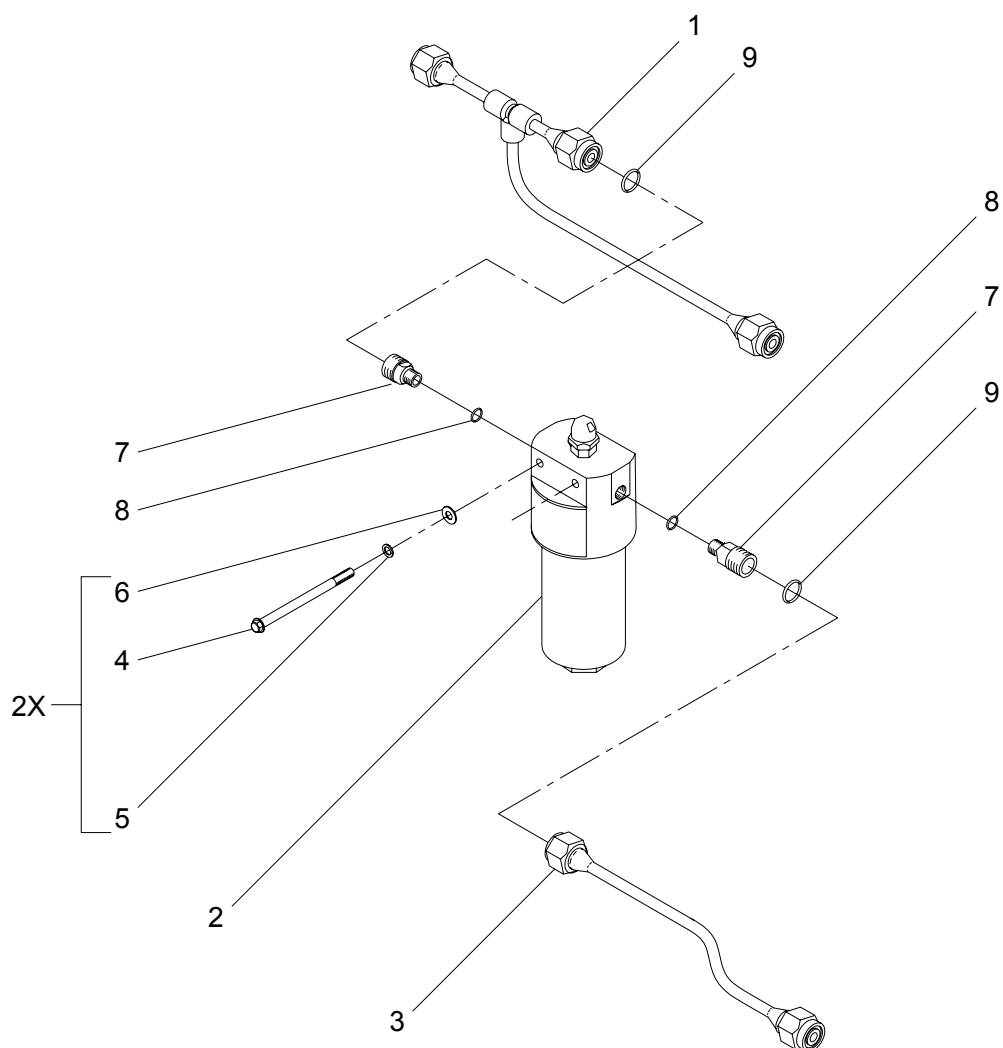
- a. Tag out system IAW current shipboard instructions.
- b. Perform system depressurization IAW paragraph 6.2.5.a.
- c. Removal (Figure 6-40).

**NOTE**

To maintain cleanliness of air system, cap, plug, or double bag all fittings and connections while performing maintenance (if not replacing immediately).

Before loosening or disconnecting any fitting on the SCBA filter panel assembly, loosen or remove pipe hangers on either side of fitting. In some cases, loosening or removing all SCBA filter panel assembly pipe hangers may be necessary.

- (1) Using 9/16" open end wrench to hold nut and 9/16" socket wrench for bolt, disconnect and remove all pipe hangers on SCBA filter panel assembly.
- (2) Remove rubber sleeves around pipe hanger portions of inlet and outlet piping.
- (3) Using 1-3/4" open end wrench, loosen union nut (1) on inlet of filter (2).
- (4) Using 1-3/8" open end wrench, loosen union nut (3) on outlet of filter (2).
- (5) Using 1/2" open end wrench, remove both hex bolts (4), lock washers (5), and washers (6) securing filter (2) to SCBA charging panel assembly.
- (6) Remove filter (2) from SCBA charging panel assembly.



**Figure 6-40. SCBA Filter (F-207)**

- (7) Using 1-1/16" open end wrench, remove thread pieces (7) from inlet and outlet of filter housing.
  - (8) Remove O-rings (8) from thread pieces and O-rings (9) from tail pieces; cut and discard O-rings.
- d. Replacement (Figure 6-40).
  - (1) Lubricate and install new O-rings (8) on thread pieces (7), and install thread pieces into new filter (2).
  - (2) Replace filter (2) in filter panel assembly, and secure with washers (6), lock washers (5), and hex bolts (4).
  - (3) Install rubber sleeves around pipe hanger portions of inlet and outlet piping.
  - (4) Install top portions of pipe hangers, and secure with hex bolts and nuts.
  - (5) Lubricate and install new O-rings (9) on tail pieces.
  - (6) Tighten union nuts (1, 3) on inlet and outlet fittings; remove Out of Service tag.
- e. Perform system pressurization and leak check IAW paragraph 6.2.5.b.
- f. Perform air sample test IAW MRC 5519/025 Q-1 (C5DU).



**6.4.2 BACK PRESSURE REGULATOR (AHP-V101).** Corrective maintenance for back pressure regulator (AHP-V101) (Figure 6-41) is limited to removal and replacement.

<b>WARNING</b>
----------------

**To prevent injury, system must be tagged out prior to performing maintenance.**

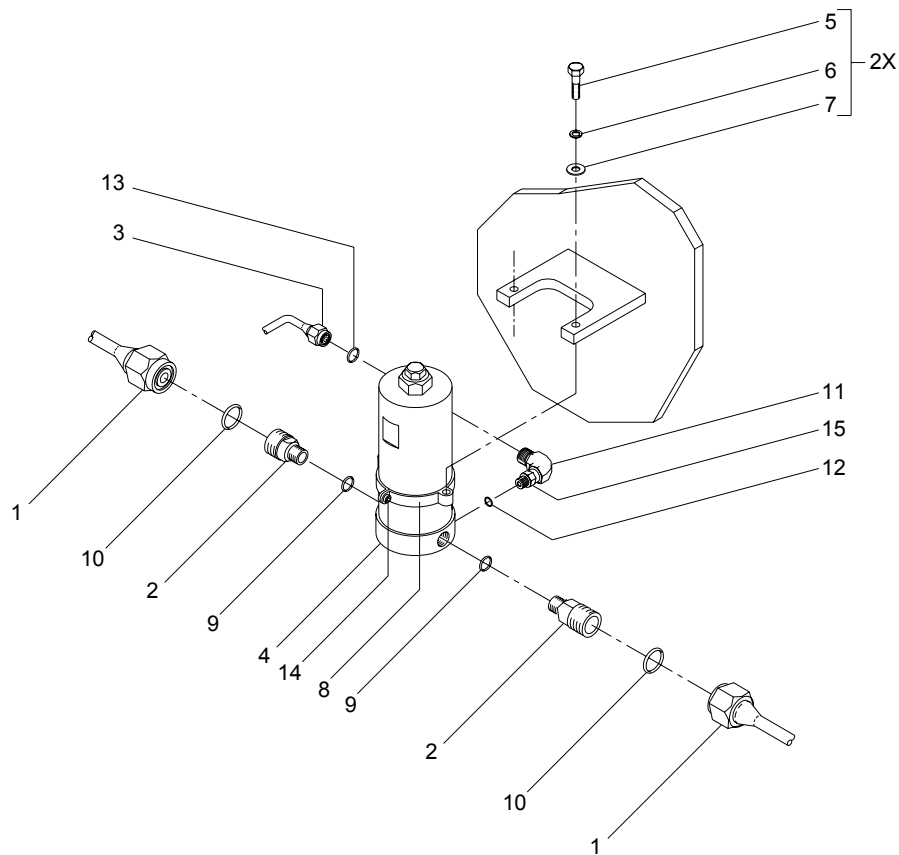
- a. Tag out system IAW current shipboard instructions.
- b. Perform system depressurization IAW paragraph 6.2.5.a.
- c. Removal (Figure 6-41).

**NOTE**

To maintain cleanliness of air system, cap, plug, or double bag all fittings and connections while performing maintenance (if not replacing immediately).

Before loosening or disconnecting any fitting on the SCBA filter panel assembly, loosen or remove pipe hangers on either side of fitting. In some cases, loosening or removing all SCBA filter panel assembly pipe hangers may be necessary.

- (1) Using 9/16" open end wrench to hold nut and 9/16" socket wrench for bolt, loosen pipe hangers as necessary to allow component removal.
- (2) Using 1-3/8" open end wrench, disconnect union nuts (1) from thread pieces (2) on back pressure regulator inlet and outlet.
- (3) Using 11/16" open end wrench, disconnect tube (3) from positionable elbow (11) on rear of back pressure regulator (4).
- (4) Using 7/16" open end wrench, remove both sets of hex bolts (5), lock washers (6), and washers (7) securing back pressure regulator mounting collar (8) to mounting bracket on SCBA charging panel assembly.
- (5) Remove back pressure regulator (4) from SCBA charging panel assembly.



**Figure 6-41. Back Pressure Regulator (AHP-V101)**

- (7) Remove O-rings (9) from thread pieces and O-rings (10) from tail pieces; cut and discard O-rings.
- (8) Using 9/16" open end wrench loosen jam nut (15), and remove positionable elbow (11) from rear of back pressure regulator (4).
- (9) Remove O-ring (12) from elbow and O-ring (13) from tail piece; cut and discard O-rings.
- (10) Using 5/32" allen wrench, remove hex head capscrew (14) securing back pressure regulator mounting collar (8) on back pressure regulator.

- d. Replacement (Figure 6-41).
- (1) Lubricate and install new O-rings (9) on thread pieces (2), and install thread pieces on new back pressure regulator (4); tighten completely.
  - (2) Lubricate and install new O-ring (12) on positionable elbow (11), and hand tighten positionable elbow on back pressure regulator (4) to allow positioning.
  - (3) Lubricate and install new O-rings (10, 13) in tail pieces.
  - (4) Slide mounting collar (8) onto back pressure regulator (4) and secure with capscrew (14).
  - (5) Position back pressure regulator (4) so that holes on mounting collar (8) align with holes on mounting bracket; install washers (7), lock washers (6), and hex bolts (5) hand tight.
  - (6) Thread union nuts (1) onto thread pieces (2) and hand tighten, and reconnect tube (3) to positionable elbow (11) hand tight.
  - (7) Fully tighten hex bolts (5) and union nuts (1).
  - (8) Fully tighten tube (3) and jam nut (15) on positionable elbow (11); remove Out of Service tag.
  - (9) Perform system pressurization and leak check IAW paragraph 6.2.5.b.
  - (10) Adjust back pressure regulator (4) IAW MRC 5519/025 18M-1 (E1ST).
- e. Perform air sample test IAW MRC 5519/025 Q-1 (C5DU).

**6.4.3 ONE-WAY CHECK VALVE (AHP-V102).** Corrective maintenance for one-way check valve (AHP-V102) (Figure 6-42) is limited to removal and replacement. Callouts refer to Figure 6-42 unless otherwise noted.

<b>WARNING</b>
----------------

**To prevent injury, system must be tagged out prior to performing maintenance.**

- a. Tag out system IAW current shipboard instructions.
- b. Perform system depressurization IAW paragraph 6.2.5.a.
- c. Removal (Figure 6-42).

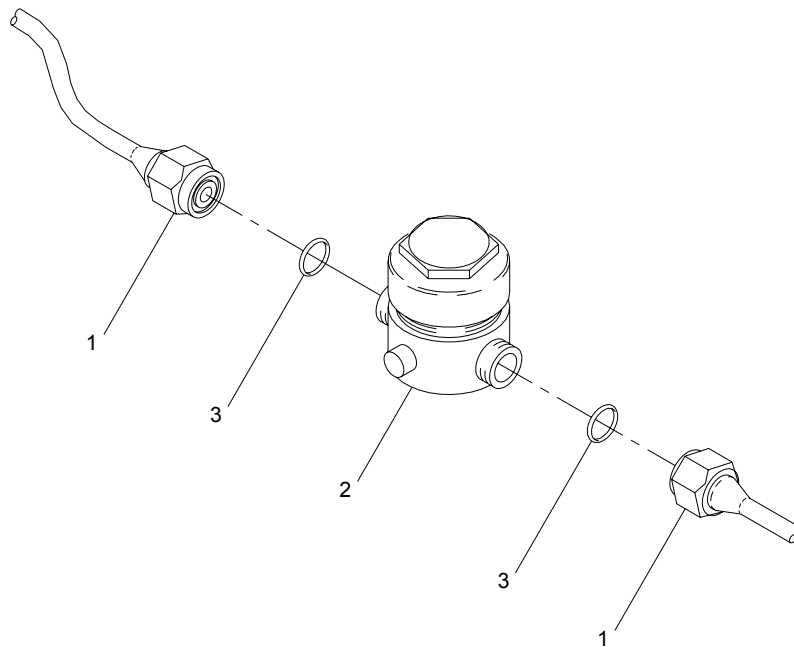
**NOTE**

To maintain cleanliness of air system, cap, plug, or double bag all fittings and connections while performing maintenance (if not replacing immediately).

Before loosening or disconnecting any fitting on the SCBA filter panel assembly, loosen or remove pipe hangers on either side of fitting. In some cases, loosening or removing all SCBA filter panel assembly pipe hangers may be necessary.

- (1) Using 9/16" open end wrench to hold nut and 9/16" socket wrench for bolt, loosen pipe hangers as necessary to allow component removal.
- (2) Using 1-3/8" open end wrench, disconnect union nuts (1) from check valve (2) inlet and outlet; remove check valve (2).
- (3) Remove O-rings (3); cut and discard.

- d. Replacement (Figure 6-42).
  - (1) Lubricate and install new O-rings (3) on both tail pieces.
  - (2) Align check valve (2) with piping, ensuring arrow on check valve points in the direction of flow.
  - (3) Tighten union nuts (1).
  - (4) Tighten pipe hangers as necessary; remove Out of Service tag.
- e. Perform system pressurization and leak check IAW paragraph 6.2.5.b.
- f. Perform functional test IAW Table 6-4.
- g. Perform air sample test IAW MRC 5519/025 Q-1 (C5DU).



**Figure 6-42. One-Way Check Valve (AHP-V102)**

**6.4.4 STOP VALVE (AHP-V103).** Corrective maintenance for stop valve (AHP-V103) is limited to removal and replacement. Callouts refer to Figure 6-43 unless otherwise noted.

<b>WARNING</b>
----------------

**To prevent injury, system must be tagged out prior to performing maintenance.**

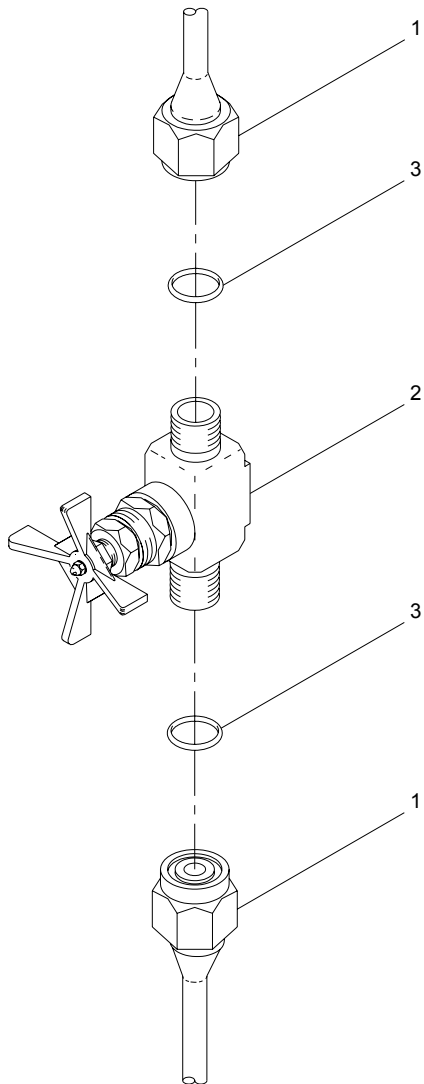
- a. Tag out system IAW current shipboard instructions.
- b. Perform system depressurization IAW paragraph 6.2.5.a.
- c. Removal (Figure 6-43).

**NOTE**

To maintain cleanliness of air system, cap, plug, or double bag all fittings and connections while performing maintenance (if not replacing immediately).

Before loosening or disconnecting any fitting on the SCBA filter panel assembly, loosen or remove pipe hangers on either side of fitting. In some cases, loosening or removing all SCBA filter panel assembly pipe hangers may be necessary.

- (1) Using 9/16" open end wrench to hold nut and 9/16" socket wrench for bolt, loosen pipe hangers as necessary to allow component removal.
- (2) Using 1-3/8" open end wrench, disconnect union nuts (1) from stop valve (2) inlet and outlet; remove stop valve (2).
- (3) Remove O-rings (3) from tail pieces; cut and discard O-rings.



**Figure 6-43. Stop Valve (AHP-V103)**

- d. Replacement (Figure 6-43).
  - (1) Lubricate and install new O-rings (3) on tail pieces.
  - (2) Position stop valve (2), and tighten union nuts (1).
  - (3) Tighten pipe hangers as necessary; remove Out of Service tag.
- e. Perform system pressurization and leak check IAW paragraph 6.2.5.b.
- f. Perform functional test IAW Table 6-4.
- g. Perform air sample test IAW MRC 5519/025 Q-1 (C5DU).



**6.4.5 PRESSURE REDUCING REGULATOR (AHP-V104).** Corrective maintenance for pressure reducing regulator (AHP-V104) is limited to removal and replacement. Callouts refer to Figure 6-44 unless otherwise noted.

<b>WARNING</b>
----------------

**To prevent injury, system must be tagged out prior to performing maintenance.**

- a. Tag out system IAW current shipboard instructions.
- b. Perform system depressurization IAW paragraph 6.2.5.a.
- c. Removal (Figure 6-44).

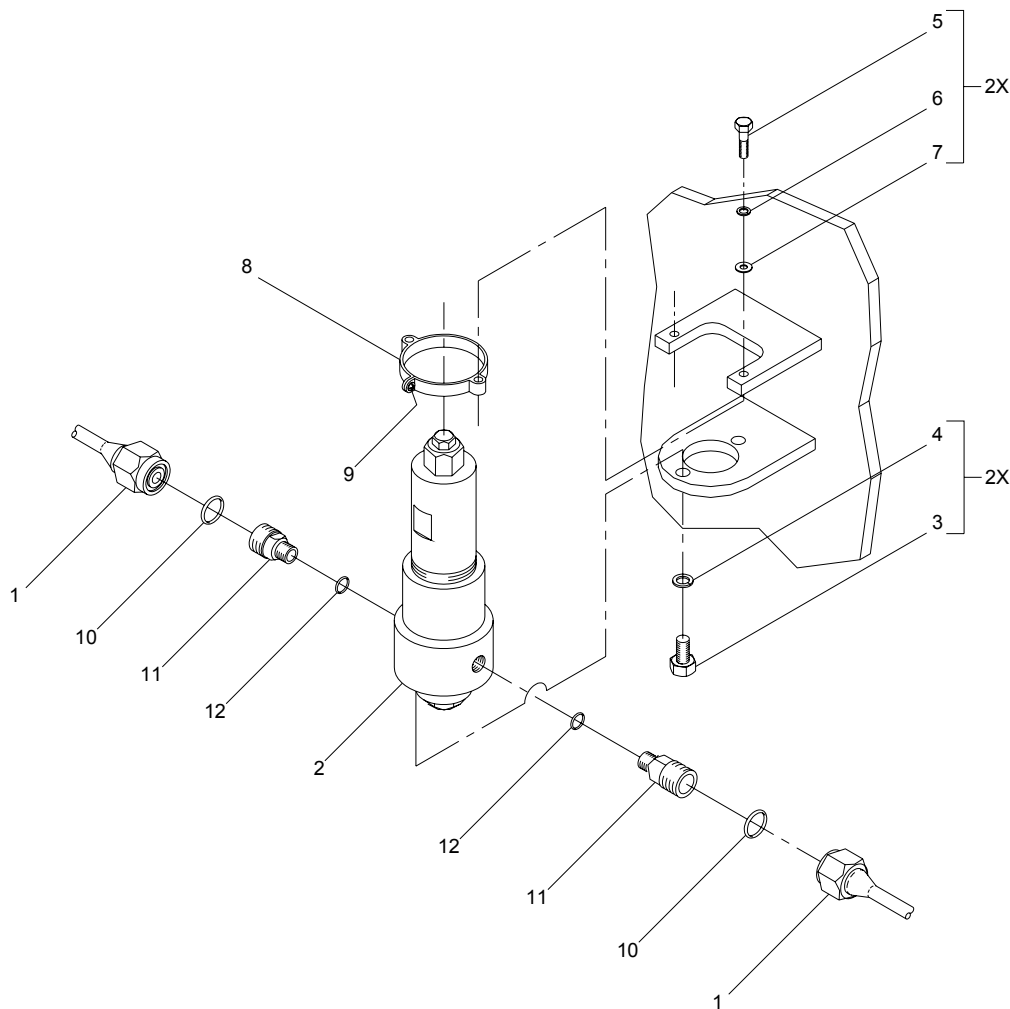
**NOTE**

To maintain cleanliness of air system, cap, plug, or double bag all fittings and connections while performing maintenance (if not replacing immediately).

Before loosening or disconnecting any fitting on the SCBA filter panel assembly, loosen or remove pipe hangers on either side of fitting. In some cases, loosening or removing all SCBA filter panel assembly pipe hangers may be necessary.

- (1) Using 9/16" open end wrench to hold nut and 9/16" socket wrench for bolt, loosen pipe hangers as necessary to allow component removal.
- (2) Using 1-3/8" open end wrench, disconnect union nuts (1) from inlet and outlet of pressure reducing regulator (2).
- (3) Using 9/16" open end wrench, remove both hex bolts (3) and lock washers (4) securing regulator (2) to lower mounting bracket.
- (4) Using 7/16" open end wrench, remove both hex bolts (5), lock washers (6), and washers (7) securing regulator mounting collar (8) to upper mounting bracket on SCBA charging panel assembly.
- (5) Using 5/32" allen wrench, loosen capscrew (9) on mounting collar (8) and slide collar down to allow regulator (2) removal; remove regulator and remove collar from regulator.

- (6) Remove O-rings (10) from tail pieces; cut and discard O-rings.
- (7) Using 7/8" open end wrench, remove thread pieces (11) from inlet and outlet of regulator (2).
- (8) Remove O-rings (12); cut and discard.



**Figure 6-44. Pressure Reducing Regulator (AHP-V104)**

d. Replacement (Figure 6-44).

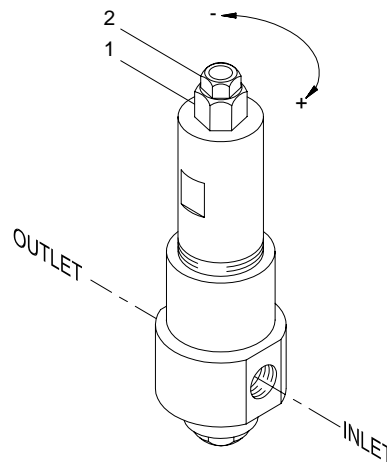
- (1) Loosely install mounting collar (8) on new pressure reducing regulator body (2).
- (2) Lubricate and install new O-rings (12) on thread pieces (11), and install thread pieces into inlet and outlet of regulator.

- (3) Lubricate and install new O-rings (10) on tail pieces.
  - (4) Position pressure reducing regulator (2) so that holes on bottom of regulator body align with holes on lower mounting bracket, ensuring outlet points right (if facing panel).
  - (5) Loosely attach pressure reducing regulator (2) to lower mounting bracket with lock washers (4) and hex bolts (3).
  - (6) Loosely attach union nuts (1) to thread pieces (11).
  - (7) Slide mounting collar (8) up and loosely attach to upper mounting bracket with lock washers (7), washers (6), and hex bolts (5); fully tighten hex capscrew (9) in mounting collar (8).
  - (8) Fully tighten union nuts (1), and fully tighten all mounting bracket hex bolts (5, 3).
  - (9) Tighten pipe hangers as necessary; remove Out of Service tag.
- e. Perform system pressurization and leak check IAW paragraph 6.2.5.b.
- f. Perform air sample test IAW MRC 5519/025 Q-1 (C5DU).
- g. Adjustment (Figure 6-45). Check and adjust the regulator set pressure as follows:
- (1) If regulated pressure downstream of regulator is between 4450 and 4550 psi, no adjustment is required.
  - (2) If pressure is below 4400 psi, loosen 7/8" hex locking nut (1) with wrench and turn 1/2" load nut (2) clockwise to increase pressure to  $4500 \pm 50$  psi (downstream of regulator). Note pressure and repeat adjustment procedure until regulator set pressure is within target pressure range.
  - (3) If pressure is above 4550 psi, do the following:
    - (a) Loosen 7/8" hex locking nut (1) with wrench and turn 1/2" load nut (2) counterclockwise to decrease pressure to  $4500 \pm 50$  psi (downstream of regulator).

**NOTE**

The regulator is not self-venting. Operator must open the H-103 hose bleed handle to vent air pressure.

- (b) Open H-103 hose bleed handle for five seconds; close handle.
- (c) Repeat adjustment of regulator until regulator set pressure is  $4500 \pm 50$  psi.



**Figure 6-45. Regulator Adjustment**

**6.4.6 RELIEF VALVE (AHP-V105).** Corrective maintenance for relief valve (AHP-V105) is limited to removal and replacement. Callouts refer to Figure 6-46 unless otherwise noted.

<b>WARNING</b>
----------------

**To prevent injury, system must be tagged out prior to performing maintenance.**

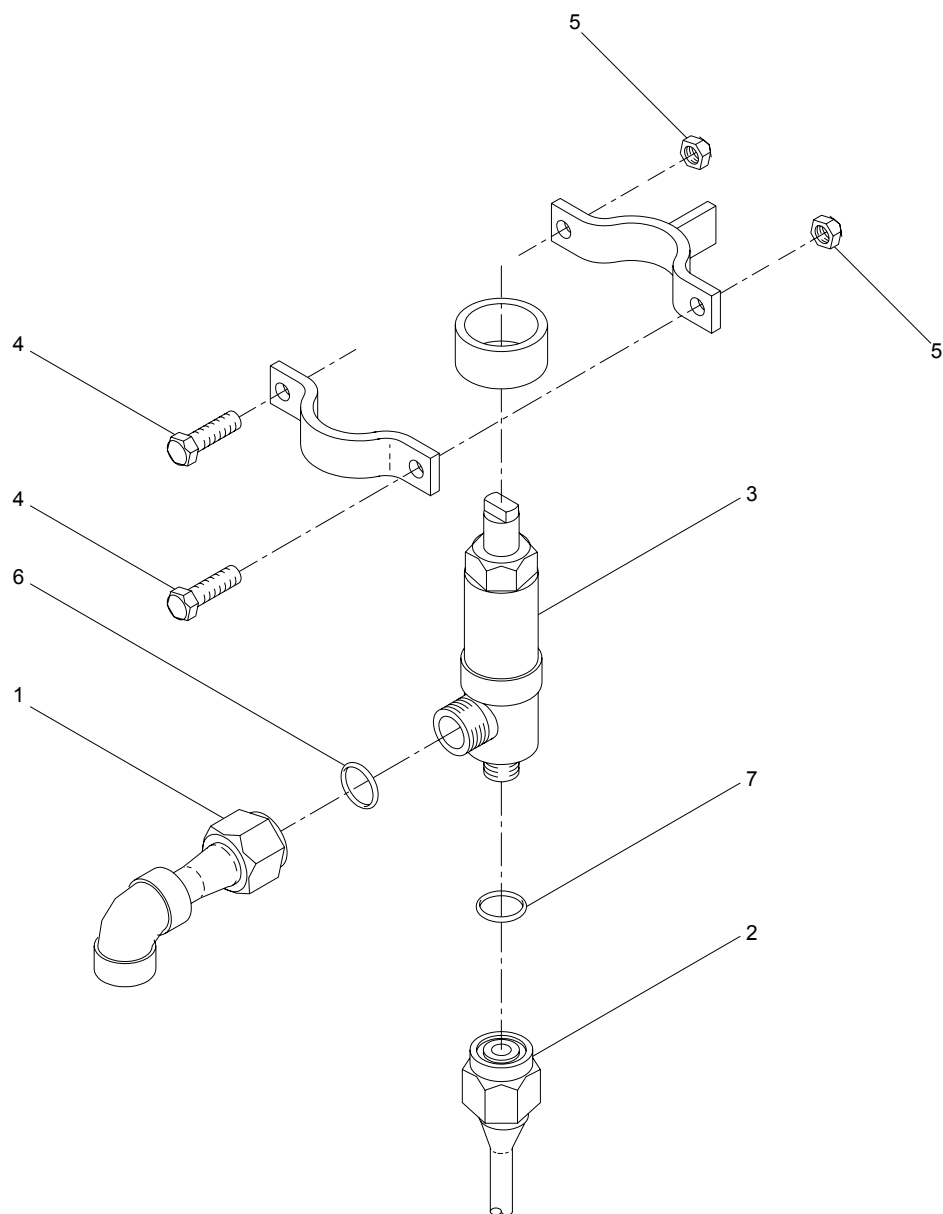
- a. Tag out system IAW current shipboard instructions.
- b. Perform system depressurization IAW paragraph 6.2.5.a.
- c. Removal (Figure 6-46).

**NOTE**

To maintain cleanliness of air system, cap, plug, or double bag all fittings and connections while performing maintenance (if not replacing immediately).

Before loosening or disconnecting any fitting on the SCBA filter panel assembly, loosen or remove pipe hangers on either side of fitting. In some cases, loosening or removing all SCBA filter panel assembly pipe hangers may be necessary.

- (1) Using 9/16" open end wrench to hold nut and 9/16" socket wrench for bolt, loosen pipe hangers as necessary to allow component removal.
- (2) Using smooth jawed pipe wrench, disconnect union nut (1) on relief valve discharge.
- (3) Using smooth jawed pipe wrench, disconnect union nut (2) from bottom of relief valve (3).
- (4) Using 9/16" open end wrench to hold nut and 9/16" socket wrench for bolt, loosen both sets of hex bolts (4) and nuts (5) on pipe hanger securing relief valve to SCBA charging panel; remove relief valve (3).
- (5) Remove O-rings (6, 7); cut and discard O-rings.



**Figure 6-46. Relief Valve (AHP-V105)**

- d. Replacement (Figure 6-46).
  - (1) Ensure relief valve (3) is tagged with set pressure and that date of last test is within 36 month periodicity.
  - (2) Lubricate and install new O-rings (6, 7) in tail pieces.
  - (3) Position relief valve (3) and connect union nut (2) to bottom of relief valve; tighten fully.
  - (4) Connect union nut (1) to relief valve discharge; tighten fully.
  - (5) Secure relief valve (3) to panel using pipe hanger; fully tighten both sets of hex bolts (4) and nuts (5).
  - (6) Tighten pipe hangers as necessary; remove Out of Service tag.
- e. Perform system pressurization and leak check IAW paragraph 6.2.5.b.
- f. Perform functional test IAW Table 6-4.
- g. Perform air sample test IAW MRC 5519/025 Q-1 (C5DU).

**6.4.7 GAUGE ISOLATION VALVES (AHP-V106 and AHP-V107).** Corrective maintenance for gauge isolation valves (AHP-V106 and AHP-V107) is limited to removal and replacement. Callouts refer to Figure 6-47 unless otherwise noted.

<b>WARNING</b>
----------------

**To prevent injury, system must be tagged out prior to performing maintenance.**

- a. Tag out system IAW current shipboard instructions.
- b. Perform system depressurization IAW paragraph 6.2.5.a.
- c. Removal (Figure 6-47).

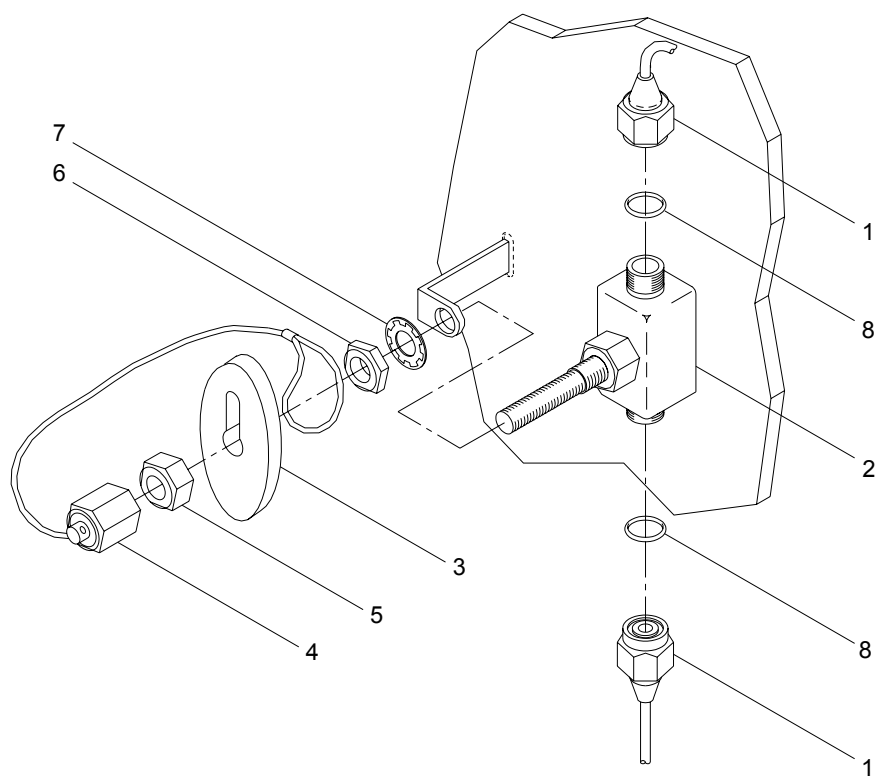
**NOTE**

To maintain cleanliness of air system, cap, plug, or double bag all fittings and connections while performing maintenance (if not replacing immediately).

Before loosening or disconnecting any fitting on the SCBA filter panel assembly, loosen or remove pipe hangers on either side of fitting. In some cases, loosening or removing all SCBA filter panel assembly pipe hangers may be necessary.

- (1) Using 9/16" open end wrench to hold nut and 9/16" socket wrench for bolt, loosen pipe hangers as necessary to allow component removal.
- (2) Using 11/16" open end wrench, disconnect union nuts (1) from top and bottom of gauge isolation valve (2).
- (3) Using large screwdriver (braced against isolation valve handle) (3) and 9/16" open end wrench, disconnect nut with lanyard (4).
- (4) Using 5/8" open end wrench, remove securing nut (5) and handle (3) from valve (2).
- (5) Slip lanyard over valve and remove nut with lanyard (4).





**Figure 6-47. Gauge Isolation Valves (AHP-V106 and AHP-V107)**

- (6) Using 3/4" open end wrench, remove panel nut (6) and lockwasher (7) from mounting bracket; remove valve (2).
- (7) Remove O-rings (8) from tailpieces; cut and discard O-rings.
- d. Replacement (Figure 6-47).
  - (1) Lubricate and install new O-rings (8) on tail pieces.
  - (2) Position new valve (2) in bracket, ensuring arrow points toward gauge.
  - (3) Install lock washer (7) and panel nut (6), and hand tighten panel nut.
  - (4) Reattach union nuts (1) to inlet and outlet of gauge isolation valve (2); fully tighten union nuts and panel nut (6).
  - (5) Install lanyard part of nut with lanyard (4) and jam nut, and center handle (3) on valve.
  - (6) Install nut part of nut with lanyard (4), and tighten jam nut and lanyard nut.
  - (7) Tighten pipe hangers as necessary; remove Out of Service tag.
- e. Perform system pressurization and leak check IAW paragraph 6.2.5.b.
- f. Perform air sample test IAW MRC 5519/025 Q-1 (C5DU).

**6.4.8 GAUGES (AHP-G101 and AHP-G102).** Corrective maintenance for gauges (AHP-G101 and AHP-G102) is limited to removal and replacement. Callouts refer to Figure 6-48 unless otherwise noted.

<b>WARNING</b>
----------------

**To prevent injury, system must be tagged out prior to performing maintenance.**

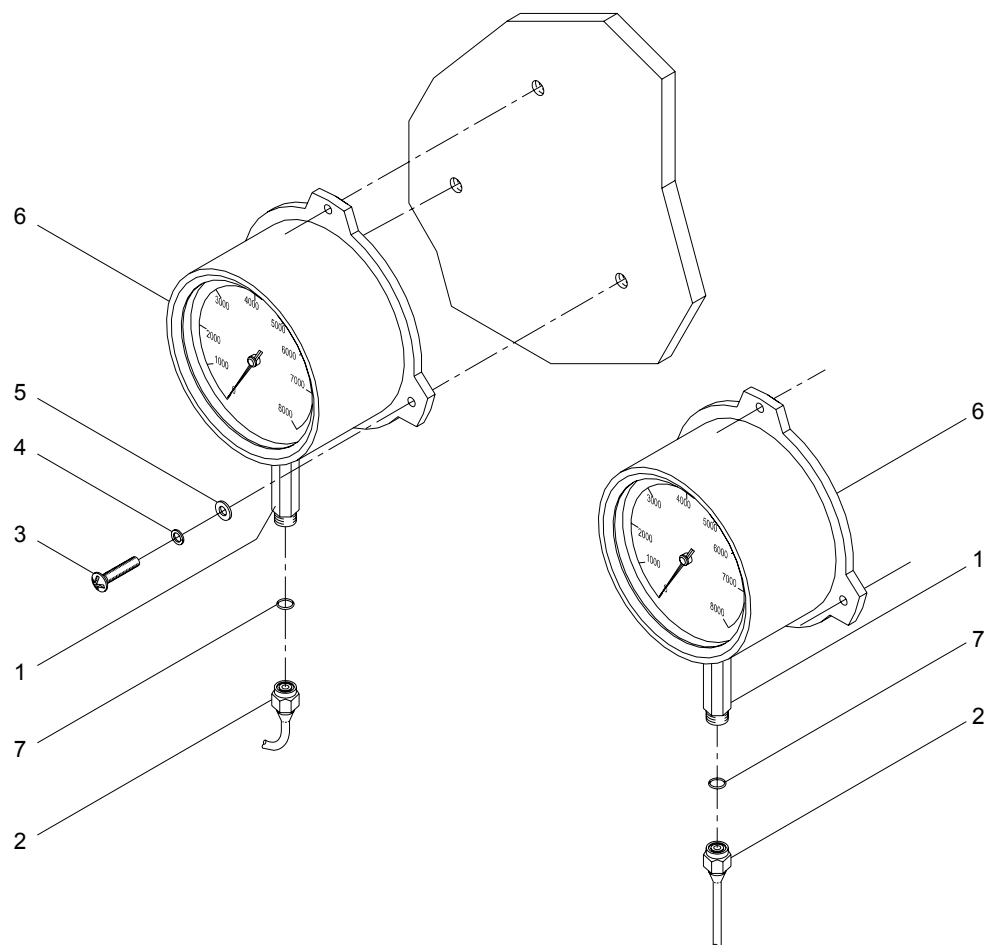
- a. Tag out system IAW current shipboard instructions.
- b. Perform system depressurization IAW paragraph 6.2.5.a.
- c. Removal (Figure 6-48).

**NOTE**

To maintain cleanliness of air system, cap, plug, or double bag all fittings and connections while performing maintenance (if not replacing immediately).

Before loosening or disconnecting any fitting on the SCBA filter panel assembly, loosen or remove pipe hangers on either side of fitting. In some cases, loosening or removing all SCBA filter panel assembly pipe hangers may be necessary.

- (1) Using 9/16" open end wrench to hold nut and 9/16" socket wrench for bolt, loosen pipe hangers as necessary to allow component removal.
- (2) Using one 9/16" open end wrench and one 11/16" open end wrench, break connection between gauge stem (1) and union nut (2).
- (3) Using large Phillips head screwdriver, remove screws (3), lock washers (4), and washers (5) securing gauge (6) to SCBA charging panel assembly; remove gauge (6).
- (4) Remove O-rings (7) in tail pieces; cut and discard O-rings.



**Figure 6-48. Gauges (AHP-G101 and AHP-G102)**

- d. Replacement (Figure 6-48).
  - (1) Lubricate and install new O-ring (7) on tail piece.
  - (2) Secure gauge stem (1) to union nut (2).
  - (3) Install new gauge (6) on SCBA charging panel assembly, and secure with washers (5), lock washers (4), and screws (3).
  - (4) Tighten pipe hangers as necessary; remove Out of Service tag.
- e. Perform system pressurization and leak check IAW paragraph 6.2.5.b.
- f. Perform air sample test IAW MRC 5519/025 Q-1 (C5DU).

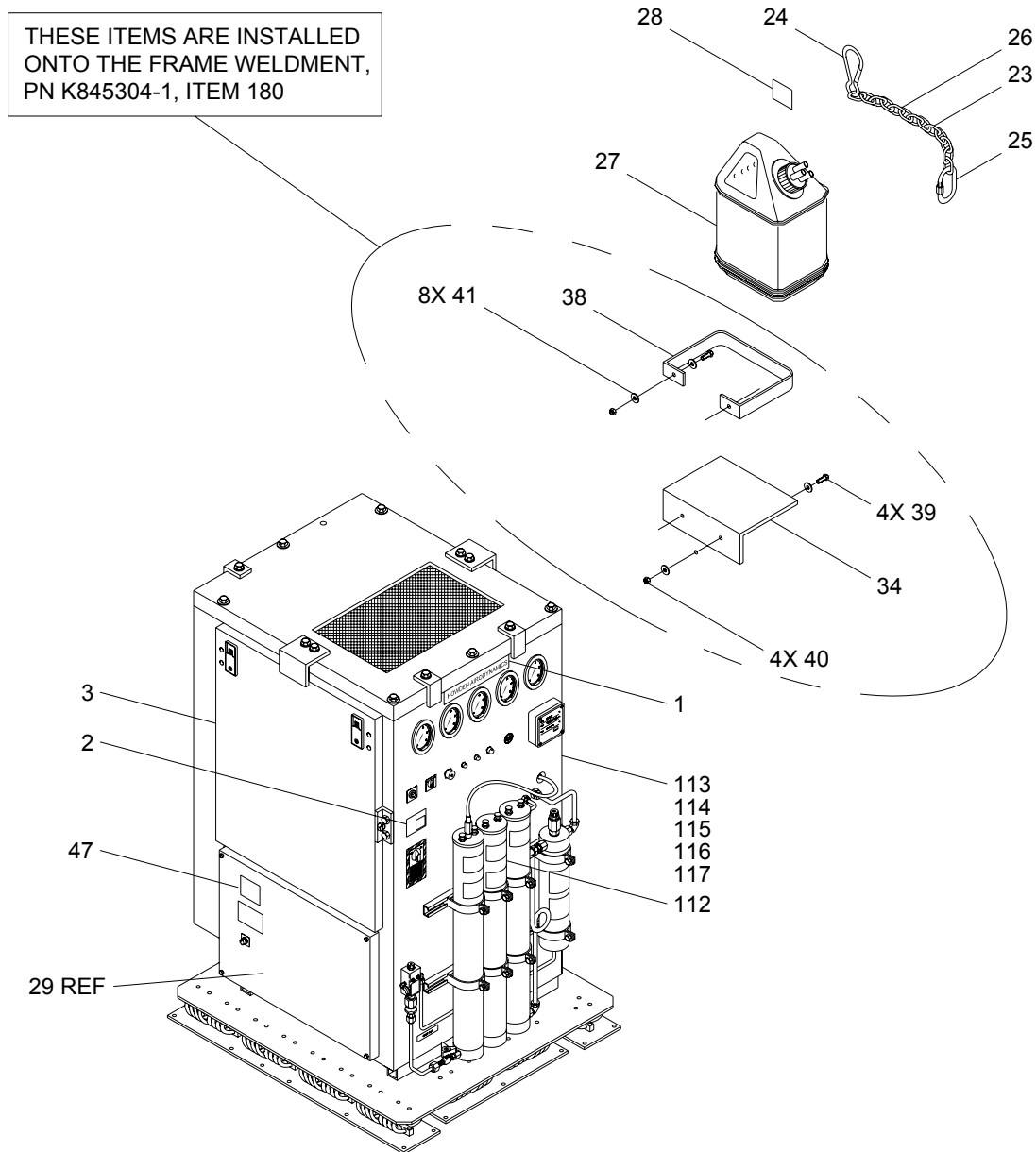
## CHAPTER 7

### ILLUSTRATED PARTS BREAKDOWN

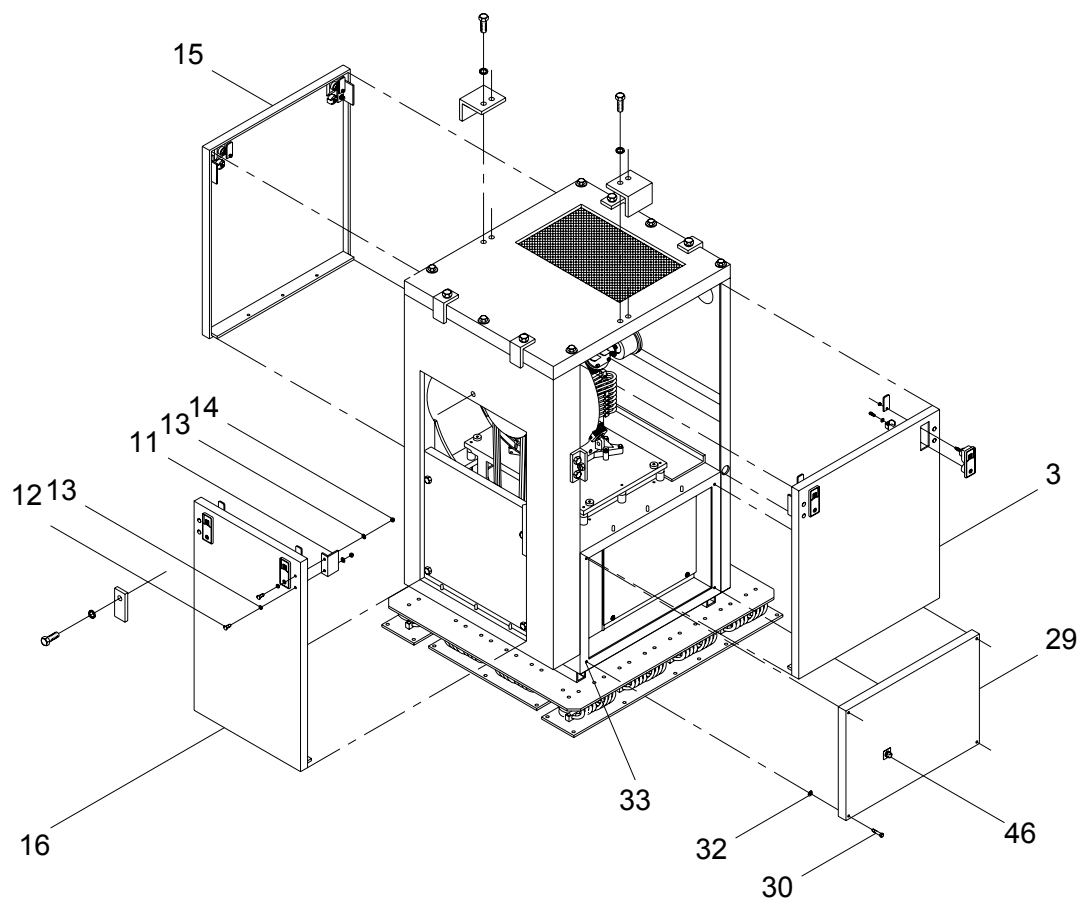
#### 7.1 SCOPE.

This chapter contains replacement parts lists and parts location illustrations to assist the maintenance technician in performing organizational-level maintenance on the Self-Contained Breathing Apparatus High Pressure Breathing Air Charging System (SCBA HP BACS) for LPD-4 Class Ships. The parts lists are presented in the form of tables showing figure/index numbers, descriptions, quantities, Commercial and Government Entity (CAGE) codes, and part/identifying numbers. The following figures and corresponding tables are included in this chapter:

<u>COMPONENT</u>	<u>FIGURE</u>	<u>TABLE</u>
High Pressure Breathing Air Compressor (HPBAC)	Figure 7-1 (8 sheets)	Table 7-1
Compressor Block Assembly	Figure 7-2 (17 sheets)	Table 7-2
HPBAC Instrument and Control Panel	Figure 7-3 (5 sheets)	Table 7-3
Air Purification System	Figure 7-4 (5 sheets)	Table 7-4
Drive Motor/Cable Assembly	Figure 7-5 (1 sheet)	Table 7-5
SCBA Filter Panel and Charging Panel Assemblies	Figure 7-6 (1 sheet)	Table 7-6
Filtered Air Supply Hose Assembly (H-103)	Figure 7-7 (1 sheet)	Table 7-7
Scott® Charging Wand	Figure 7-8 (1 sheet)	Table 7-8

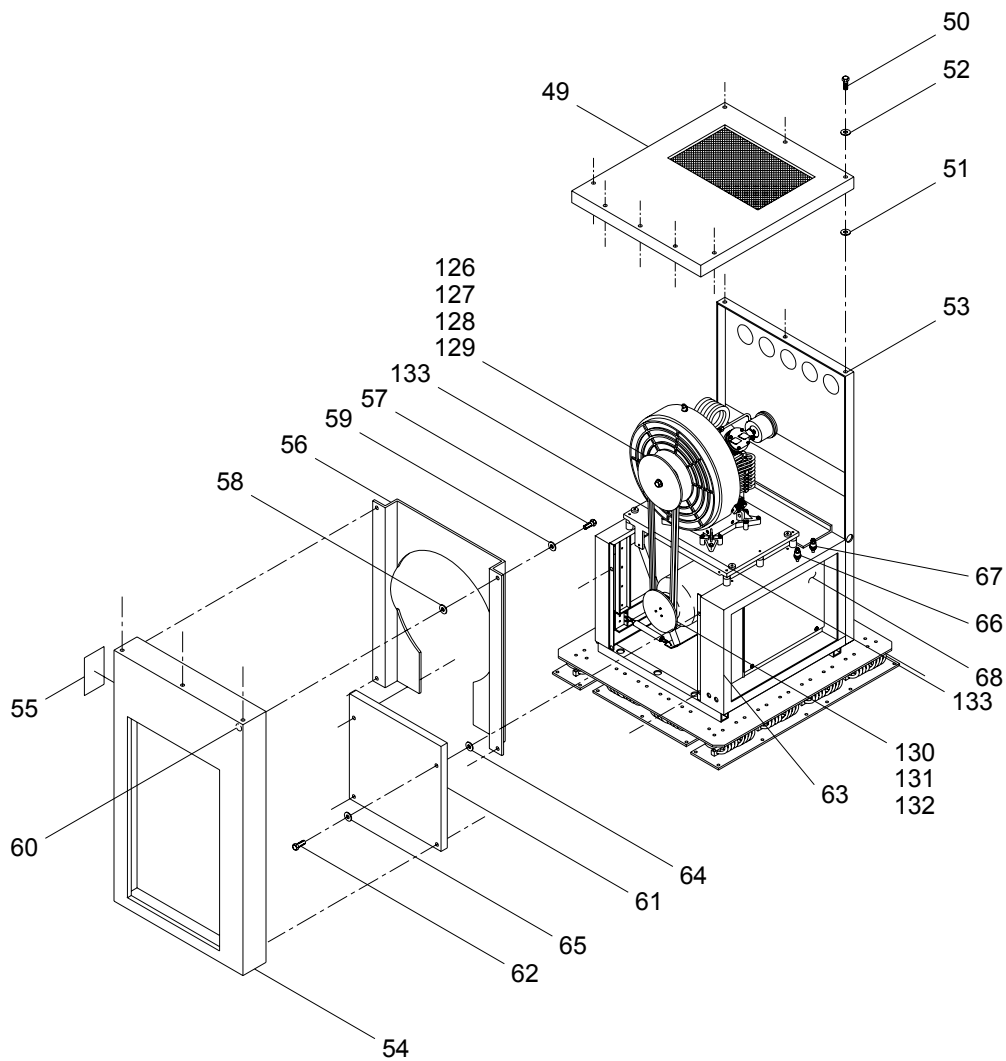


**Figure 7-1. High Pressure Breathing Air Compressor (HPBAC) (Sheet 1 of 8)**

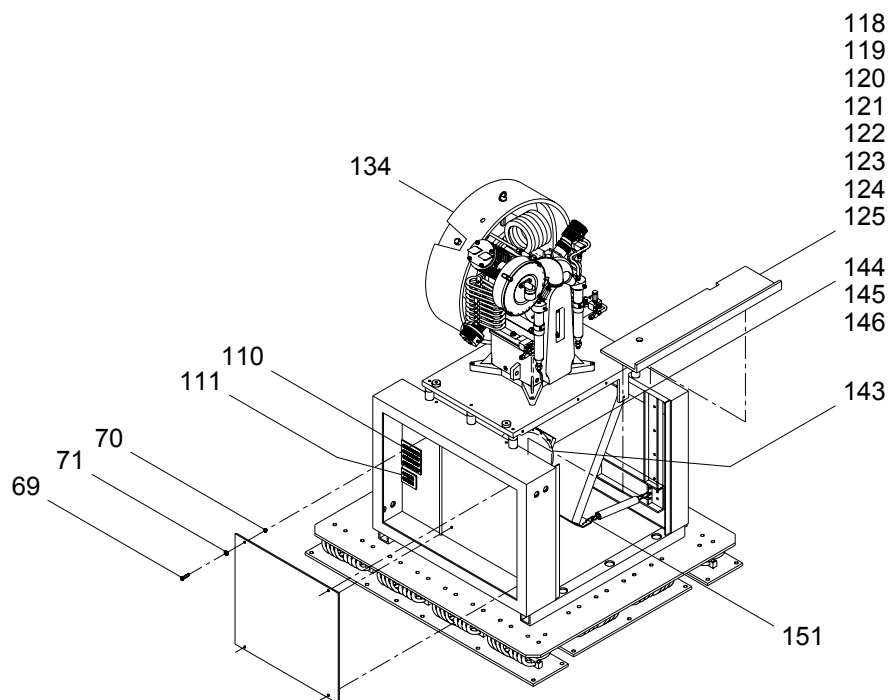
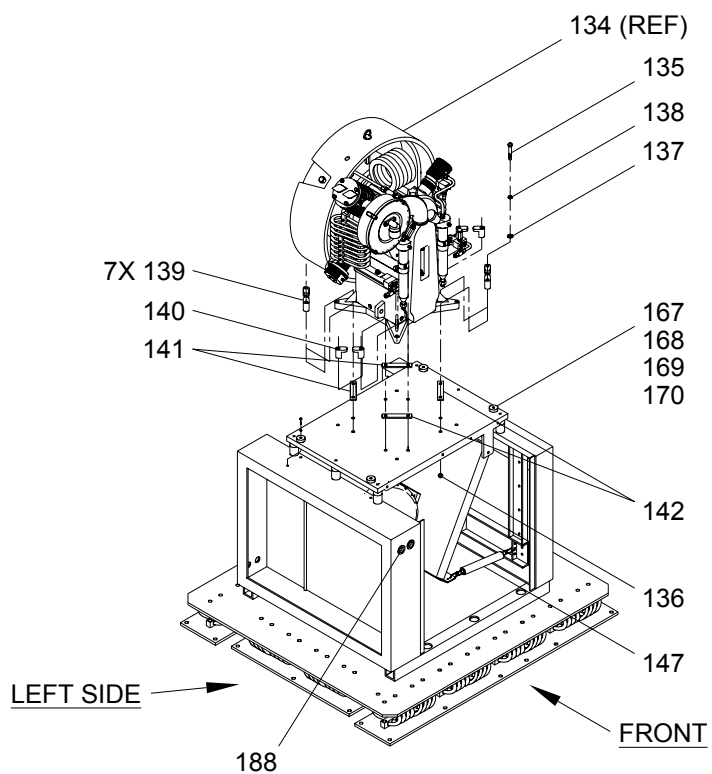


**Figure 7-1. High Pressure Breathing Air Compressor (HPBAC) (Sheet 2)**

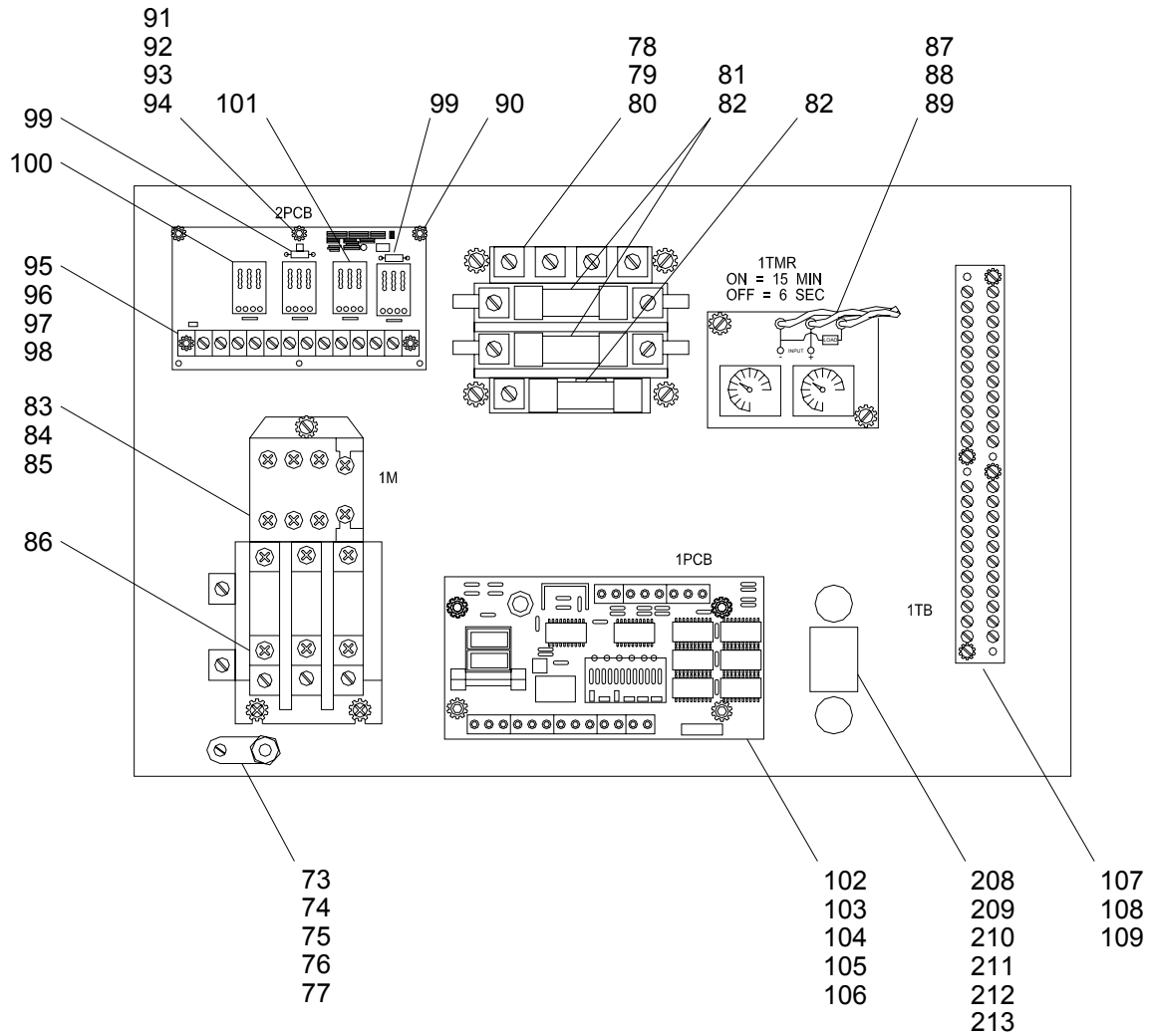




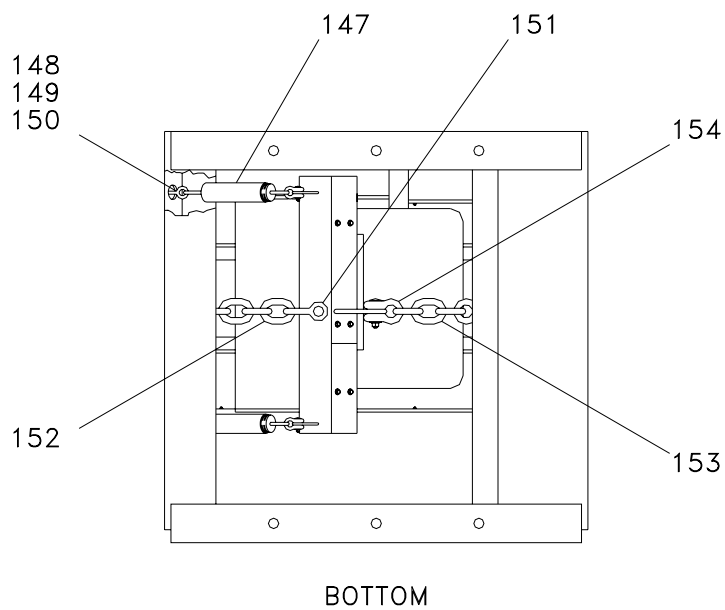
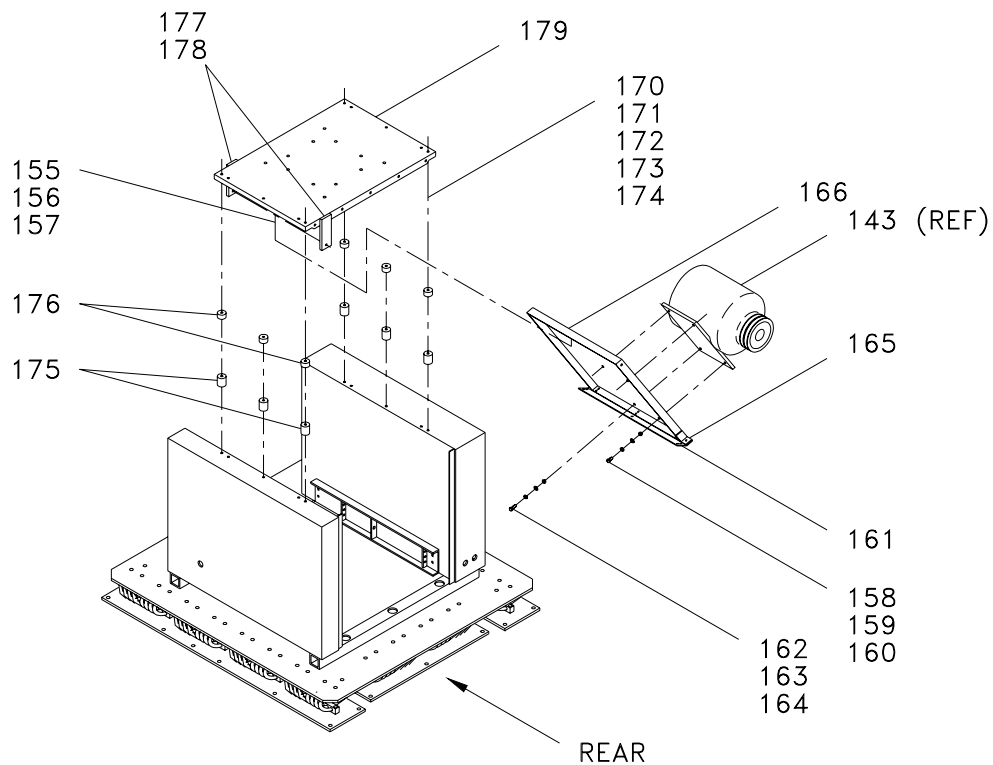
**Figure 7-1. High Pressure Breathing Air Compressor (HPBAC) (Sheet 3)**



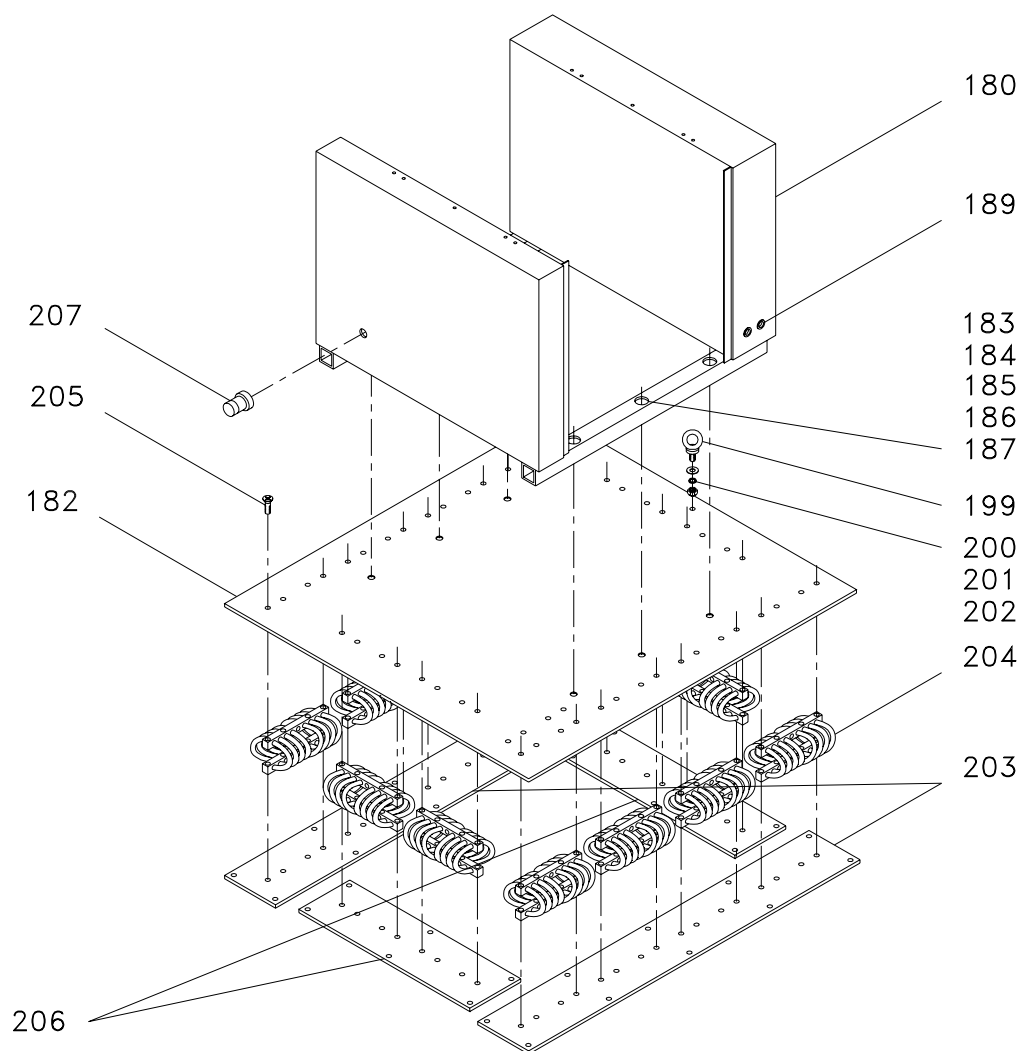
**Figure 7-1. High Pressure Breathing Air Compressor (HPBAC) (Sheet 4)**



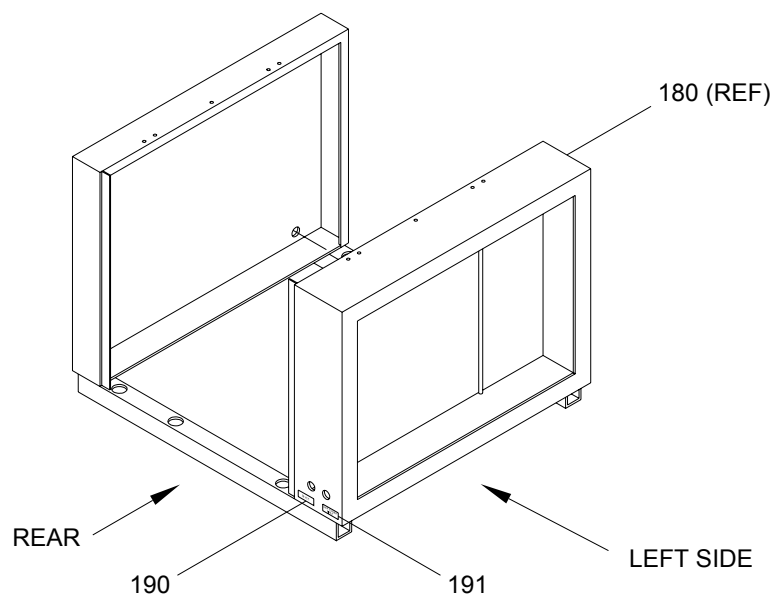
**Figure 7-1. High Pressure Breathing Air Compressor (HPBAC) (Sheet 5)**



**Figure 7-1. High Pressure Breathing Air Compressor (HPBAC) (Sheet 6)**



**Figure 7-1. High Pressure Breathing Air Compressor (HPBAC) (Sheet 7)**



**Figure 7-1. High Pressure Breathing Air Compressor (HPBAC) (Sheet 8)**

**Table 7-1. High Pressure Breathing Air Compressor (HPBAC) Parts List**

FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
7-1	High Pressure Breathing Air Compressor (HPBAC)	REF		K966038-02
1	. Nameplate	1		K300380-1
2	. Label, Identification	1		K300379-02
	. Compressor VT26-E3	1		K600133-1
	Panel Assembly, #1	2		K845279-1
3	Panel, #1 (Mod)	1		K300367-1
4	Not Used			
5	Not Used			
6	Not Used			
7	Not Used			
8	Not Used			
9	Not Used			
10	Not Used			
11	Angle	2		K300366-1
	Attaching Parts			
12	Bolt, Hex Head, 1/4-20 x 3/4"	4		400-211-022
13	Washer, 1/4"	8		400-270-039
14	Nut, Self-Locking, 1/4-20	4		400-160-017
	---*---			
	Panel Assembly, #2	1		K845279-1
15	Panel, #2 (Mod)	1		K300368-1
16	Panel, Rear	1	57328	PNL-0380
17	Not Used			
18	Not Used			
19	Not Used			
20	Not Used			
21	Not Used			
22	Not Used			
	Chain Assembly	1		K845284-1
23	Chain, Grade 30 Steel, 18"	1		400-033-001
24	Snap, Load Rated	1		400-033-002
25	Connector, Threaded	1		400-033-003
26	Sleeving, Shrink, 17"	1		400-1012-1000
27	Reservoir, Condensate	1	57328	CNS-4/ASY
28	Label, Warning, Oily Waste	1		K300362-1
29	Cover, Electric Panel (Mod)	1		K845291-1

**Table 7-1. High Pressure Breathing Air Compressor (HPBAC) Parts List - Continued.**

FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
	Attaching Parts			
30	Screw, Hex Head, 1/4-20 x 1-1/2"	4	57328	SCR0034
31	Not Used			
32	Washer, Flat, 1/4"	4	57328	WAS0063
33	Nut, Cage, 1/4"	4	57328	NUT0133
	---*---			
34	Bracket, Lower, Condensate Reservoir	1	57328	BRK0126
	Attaching Parts			
35	Not Used			
36	Not Used			
37	Not Used			
	---*---			
38	Bracket, Upper, Condensate Reservoir	1	57328	BRK0125
	Attaching Parts			
39	Screw, Hex Head, 1/4-20 x 3/4"	4	57328	SCR0011
40	Nut, Lock, 1/4"	4	57328	NUT0005
41	Washer, Flat, 1/4"	8	57328	WAS0063
42	Not Used			
43	Not Used			
44	Not Used			
45	Not Used			
	---*---			
46	Button, Reset	1		400-270-035
47	Plate, Warning	1		K845116
48	Not Used			
49	Panel, Roof	1	57328	PNL0272
	Attaching Parts			
50	Screw, Hex Head, 1/4-20 x 3/4"	6	57328	SCR0011
51	Washer, Lock, 1/4"	6	57328	WAS0033
52	Washer, Flat, 1/4"	6	57328	WAS0063
53	Nut, Cage, 1/4"	6	57328	NUT0133
	---*---			
54	Enclosure, Belt Guard	1	57328	ENC0035
55	Label, Compressor Lubrication	1		K300299-01
56	Plenum, Cooling Air	1	57328	PLN0051



**Table 7-1. High Pressure Breathing Air Compressor (HPBAC) Parts List - Continued.**

FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
	Attaching Parts			
57	Screw, Hex Head, 1/4-20 x 3/4"	6	57328	SCR0011
58	Washer, Lock, 1/4"	6	57328	WAS0033
59	Washer, Flat, 1/4"	6	57328	WAS0063
60	Nut, Cage, 1/4"	6	57328	NUT0133
	---*---			
61	Panel, Sheave/Belt Guard	1	57328	PNL0276
	Attaching Parts			
62	Screw, Hex Head, 1/4-20 x 3/4"	4	57328	SCR0011
63	Nut, Lock, 1/4"	4	57328	NUT0005
64	Washer, Lock, 1/4"	4	57328	WAS0033
65	Washer, Flat, 1/4"	4	57328	WAS0063
	---*---			
66	Switch, Final Pressure, 4000-7500psi, 1/4" NPTm	1	57328	SWT0160
67	Switch, Oil Pressure, 430-1700psi, 1/4" NPTm	1	57328	SWT0119
68	Panel, Electrical (Mod)	1		K845315-1
	Attaching Parts			
69	Screw, Hex Head, 1/4-20 x 3/4"	4	57328	SCR0011
70	Nut, 1/4-20	4	57328	NUT-0005
71	Washer, Flat, 1/4"	4	57328	WAS0063
72	Not Used			
73	Terminal, Grounding	4		400-1073-152
	Attaching Parts			
74	Bolt, Hex Head, 1/4-20 x 1	1	57328	400-211-066
75	Nut, 1/4-20	2	57328	NUT-0005
76	Washer, Flat, 1/4"	2	57328	WAS0063
77	Washer, Lock, 1/4"	1	57328	WAS0033
	---*---			
78	Transformer	1	57328	TRR0060
	Attaching Parts			
79	Screw, Slotted Head, #8-32 x 1/2"	4		400-211-102
80	Washer, Lock, #8	4		400-270-063
	---*---			
81	Fuse, Primary	2	57328	FUS0074
82	Fuse, Secondary	1	57328	FUS0006

**Table 7-1. High Pressure Breathing Air Compressor (HPBAC) Parts List - Continued.**

FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
83	Starter, Motor	1	57328	SRT0151
	Attaching Parts			
84	Screw, Slotted Head, #6-32 x 5/8"	2		400-211-103
85	Washer, Lock, #6	2		400-270-057
	---*---			
86	Relay, Overload	1	57328	RLY0101
87	Timer, ACD	1	57328	TMR0008
	Attaching Parts			
88	Screw, Slotted Head, #6-32 x 1-1/4"	2		400-211-104
89	Washer, Lock, #6	2		400-270-057
	---*---			
90	PCB Assembly, Remote	1		K845249-2
	Attaching Parts			
91	Screw, Self-Locking	6		NAS1352C06LL6
92	Nut, #6	6		MS21083C04
93	Washer, Flat, #6	12		NAS620C6L
94	Stand-Off	6		400-217-055
	---*---			
95	Terminal Block	1		400-241-059
	Attaching Parts			
96	Screw	2		NAS1352C06-12
97	Nut	2		MS21083C06
98	Washer	4		NAS620C6
	---*---			
99	Resistor	1		RLR20C6981FS
100	Relay, 4PDT, 115 Vac	2		400-194-022
101	Relay, Contact, 28 Vac	2		400-194-025
102	PCB Assembly	1	57328	CNT0014
	Attaching Parts			
103	Screw, Self-Locking	4		NAS1352C06LL6
104	Nut, #6	4		MS21083C06
105	Washer, Flat, #6	8		NAS620C6L
106	Stand-Off	4		400-217-055
	---*---			
107	Terminal Block	1		400-1073-145

**Table 7-1. High Pressure Breathing Air Compressor (HPBAC) Parts List - Continued.**

FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
	Attaching Parts			
108	Screw, Slotted Head, #6-32 x 1/2"	2		400-211-105
109	Washer, Flat, #6	2		400-270-064
	---*---			
110	Plate, Label, Ship Electric	1		K300385-1
111	Plate, Label, Conn. Dav.	1		K300386-1
112	P-10 Air Purification System (See Figure 7-4)	REF		K600133
113	Panel, Front (Mod) (Instrument and Control Panel) (see Figure 7-3)	REF		K845292-2
	Attaching Parts			
114	Screw, Hex Head, 1/4-20 x 3/4"	4	57328	SCR0011
115	Washer, Lock, 1/4"	4	57328	WAS0033
116	Washer, Flat, 1/4"	4	57328	WAS0063
117	Nut, Cage, 1/4"	4	57328	NUT0133
	---*---			
118	Cover, Motor Well	1	57328	CVR0136
	Attaching Parts			
119	Screw, Hex Head, 1/4-20 x 3/4"	4	57328	SCR0011
120	Washer, Lock, 1/4"	4	57328	WAS0033
121	Washer, Flat, 1/4"	4	57328	WAS0063
122	Bolt, Carriage, 1/4-20 x 3/4"	2	57328	BLT0038
123	Nut, Lock, 1/4-20	2	57328	NUT0005
124	Washer, Flat, 1/4"	2	57328	WAS0063
125	Nut, Cage, 1/4"	4	57328	NUT0133
	---*---			
126	Guard, Belt, Flywheel	1		K300319-2
	Attaching Parts			
127	Screw, Hex Head, 1/4-20 x 3/4"	1	57328	SCR0111
128	Washer, Lock, 1/4"	1	57328	WAS0001
129	Plate, Retaining	1	57328	068646
	---*---			
130	Guard, Belt, Motor	1		K300387-1
	Attaching Parts			
131	Bolt, Hex Head, 1/4-20 x 1-1/4"	3		400-211-106
132	Washer, Lock, 1/4"	3	57328	WAS0033
	---*---			

**Table 7-1. High Pressure Breathing Air Compressor (HPBAC) Parts List - Continued.**

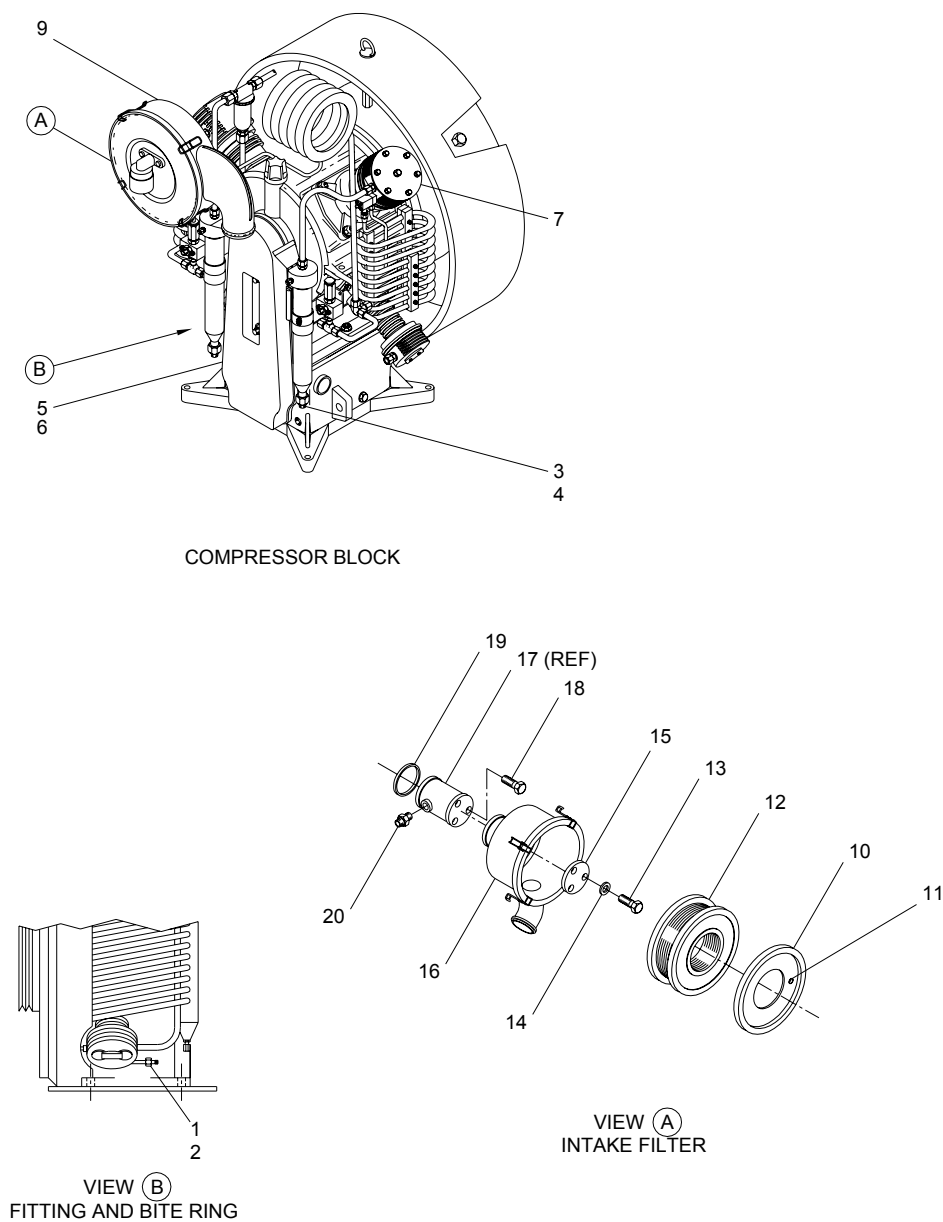
FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
133	V-Belt, 84" OD	2	57328	BET-0068
134	Compressor, High Pressure, 1K 180 (see Figure 7-2)	1		K966033-1
	Attaching Parts			
135	Screw, Socket Head, 5/16-18	8		400-211-067
136	Nut, 5/16-18	8		400-160-010
137	Washer, Flat, 5/16	16		AN960C516L
138	Washer, Lock, 5/16	8		400-211-067
139	Clamp	7		K300372-1
140	Clamp	1		K300393-1
141	Plate, Shim	2		K300373-1
142	Plate, Shim	2		K300392-1
	---*---			
143	Motor, Electric (see Figure 7-5)	1		K600133-10
	Attaching Parts			
144	Bolt, Hex Head, 3/8-16 x 1-3/4"	4		400-211-107
145	Washer, Flat, 3/8"	8		400-270-049
146	Nut, Lock, 3/8-16	4		400-160-025
	---*---			
147	Spring, 1-3/8 x 7.0 Steel	4		400-218-038
	Attaching Parts			
148	Screw, Hex Head, 3/8-16 x 1"	4		400-211-059
149	Nut, Hex Head, Zinc Plated	4		400-180-016
150	Washer, 1.5 x 13/32 ID .62	4		400-270-037
	---*---			
151	D-Shackle	4		400-004-002
152	Chain, Welded Steel	1		K300377-1
153	Chain, Welded Steel	1		K300378-1
154	Shackle, Anchor	4		400-004-001
	Attaching Parts			
155	Nut, Self-Locking, 3/4-10	4		400-160-020
156	Washer, Flat, 3/4"	4		400-270-044
157	Rod, Threaded, 3/4"	1		K300402-1
	---*---			
	Plate Assembly, Motor	1		K845303-1
158	Nut, Self-Locking, 1/4-20	2	57328	NUT-0005

**Table 7-1. High Pressure Breathing Air Compressor (HPBAC) Parts List - Continued.**

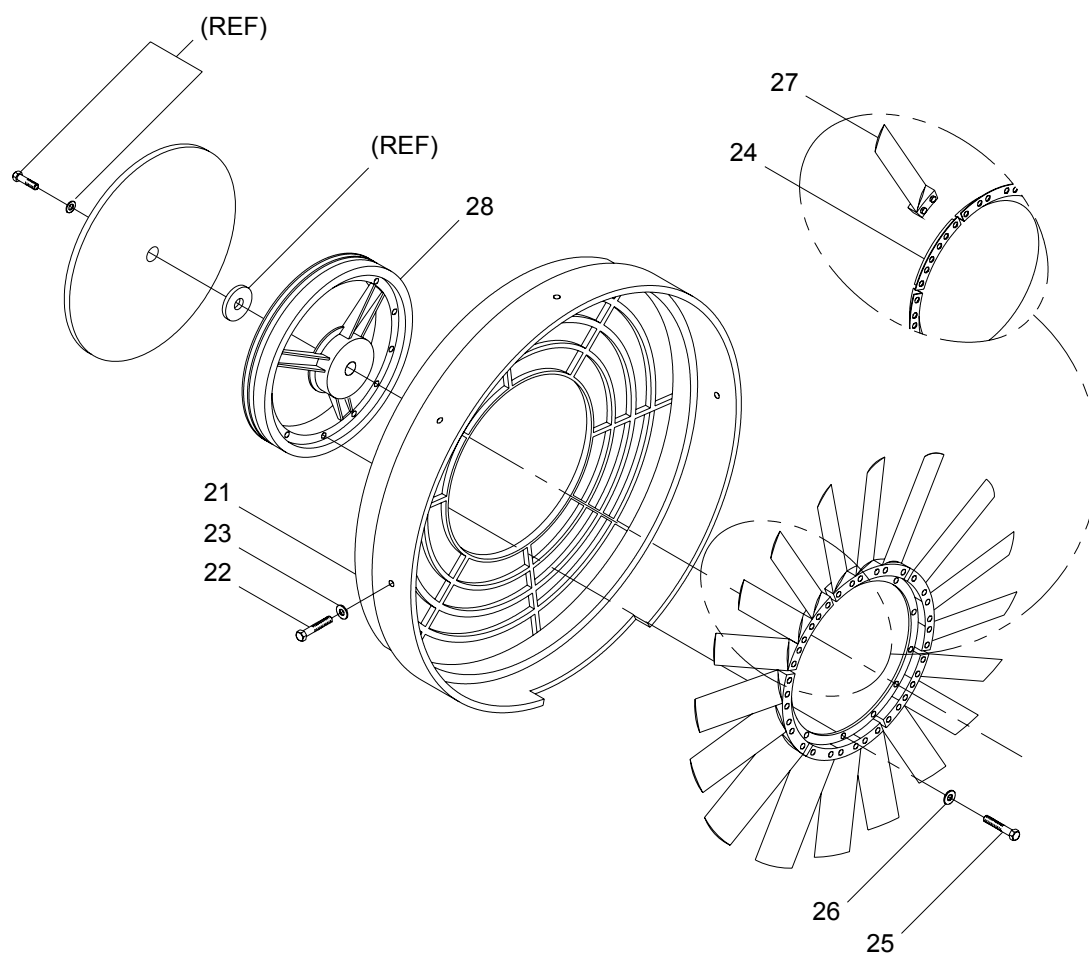
FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
159	Bolt, Hex Head, 1/4-20 x 1"	2		400-211-066
160	Washer, 1/4"	4		400-270-039
161	Angle	1		K300350-1
162	Nut, Self-Locking, 1/4-20	4		400-160-017
163	Bolt, Hex Head, 1/4-20 x 3/4"	4		400-211-022
164	Washer, 1/4"	8		400-270-039
165	Plate	1		K300348-1
166	Plate, Motor	1		K300347-1
	Plate Assembly, Compressor	1		K845305-1
	Attaching Parts			
167	Nut, Hex	8		MS21083C6
168	Washer	8		K300346-1
169	Not used			
170	Washer, square	6		400-270-051
171	Screw, Hex Head, 1/2-13x3.5"	6		400-211-091
172	Washer, Lock, 1/2"	6		400-270-035
173	Nut, 1/2-13"	6		400-160-007
174	Washer, 1/2"	6		400-270-054
175	Spacer	6		K300424-1
176	Not used			
	---*---			
177	Not used			
178	Not used			
179	Plate, Compressor	1		K300360-1
180	Frame Weldment	1		K845304-1
181	Not used			
182	Plate, Base	1		K300354-1
	Attaching Parts			
183	Screw, 3/4-10 x 2", SKTHO FLT	2		400-211-064
184	Nut, Hex, 3/4 x 10 UNC	6		400-160-015
185	Washer, Split Lock	6		400-270-040
186	Washer, Large OD	6		400-270-036
187	Screw, Cap Soc, 3/4-10 x 1"	4		400-211-060
	---*---			
188	Grommet	2		400-102-008

**Table 7-1. High Pressure Breathing Air Compressor (HPBAC) Parts List - Continued.**

FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
189	Grommet	2		400-102-007
190	Label, 28 Vdc	1		K300323-1
191	Label, Ship Power Input	1		K845141-1
192	Not used			
	Attaching Parts			
193	Not used			
	---*---			
194	Not used			
195	Not used			
196	Not used			
197	Not used			
	Attaching Parts			
198	Not used			
	---*---			
199	Eyebolt	1		400-073-002
	Attaching Parts			
200	Nut, 1/2 x 13	1		400-180-007
201	Washer, Lock, 1/2"	1		400-270-035
202	Washer, Flat	2		AN960C816
	---*---			
203	Plate, Cable Mount	2		K300405-2
204	Isolator, Coiled	12		400-126-011
	Attaching Parts			
205	Screw, FH, 3/8-24x1.75 LG	96		400-211-093
	---*---			
206	Plate	2		K300405-1
207	Cap, Oil Drain	1	57328	CAP-0017
208	Transformer	1		400-245-***
	Attaching Parts			
209	Stand-off	2		K300448-1
210	Washer	2		K300449-1
211	Screw, Socket Hd, 5/16-18 x 2.00	2		400-211-100
212	Washer, Flat, 5/16	2		400-270-062
213	Nut, Self-locking, 5/16-18	2		400-160-031
	---*---			



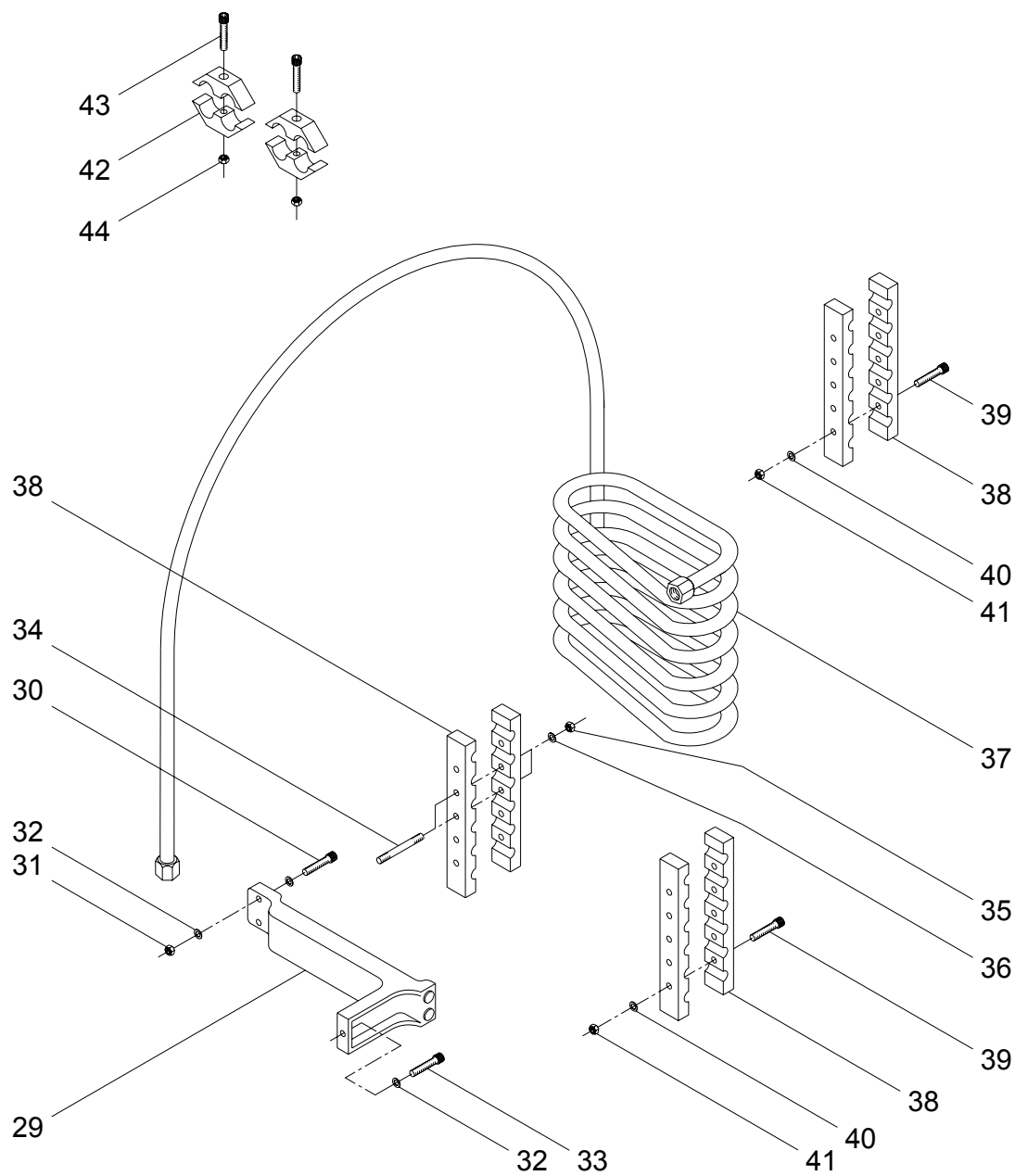
**Figure 7-2. Compressor Block Assembly (Sheet 1 of 17)**



FLYWHEEL/COOLING FAN

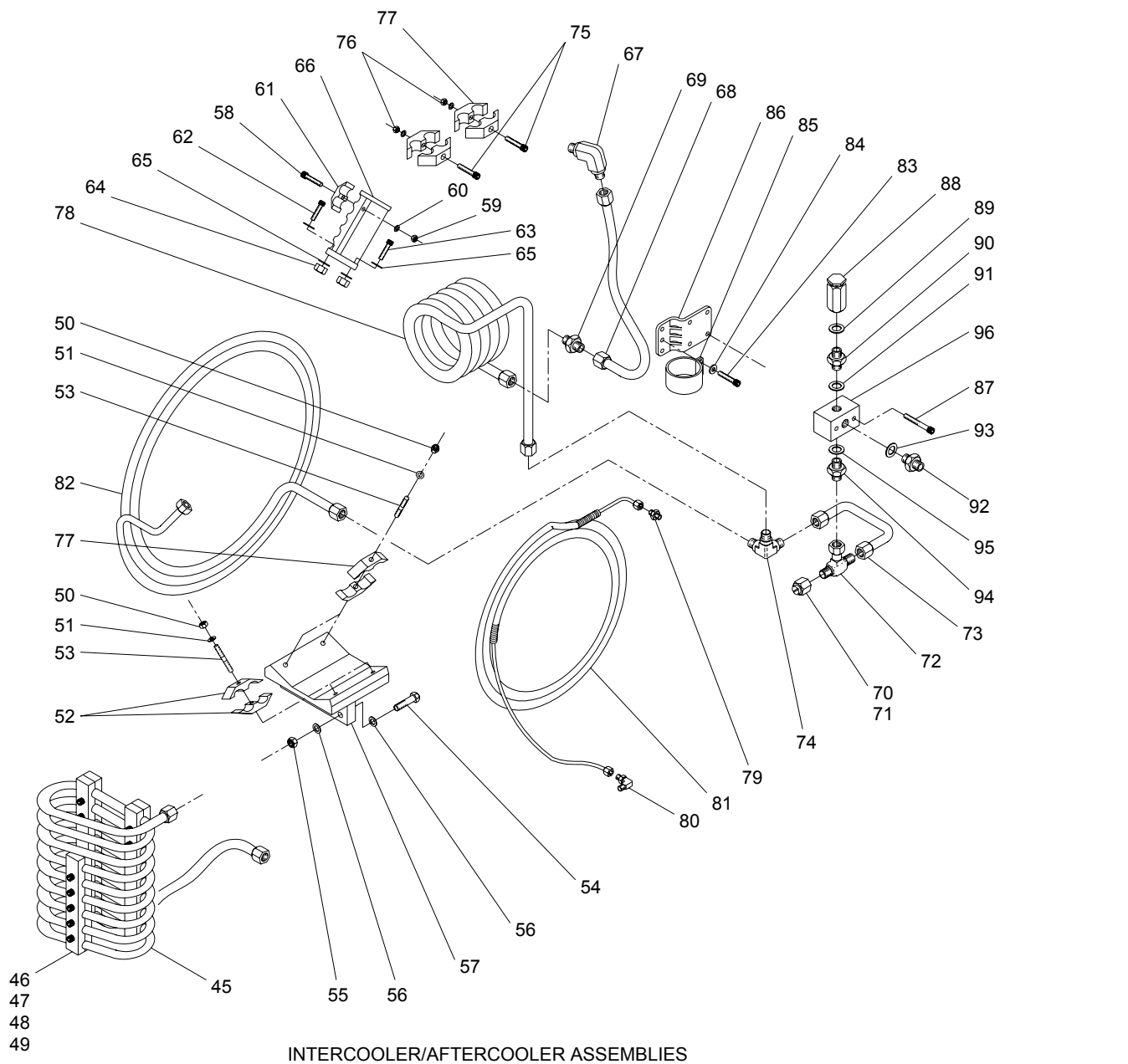
**Figure 7-2. Compressor Block Assembly (Sheet 2)**



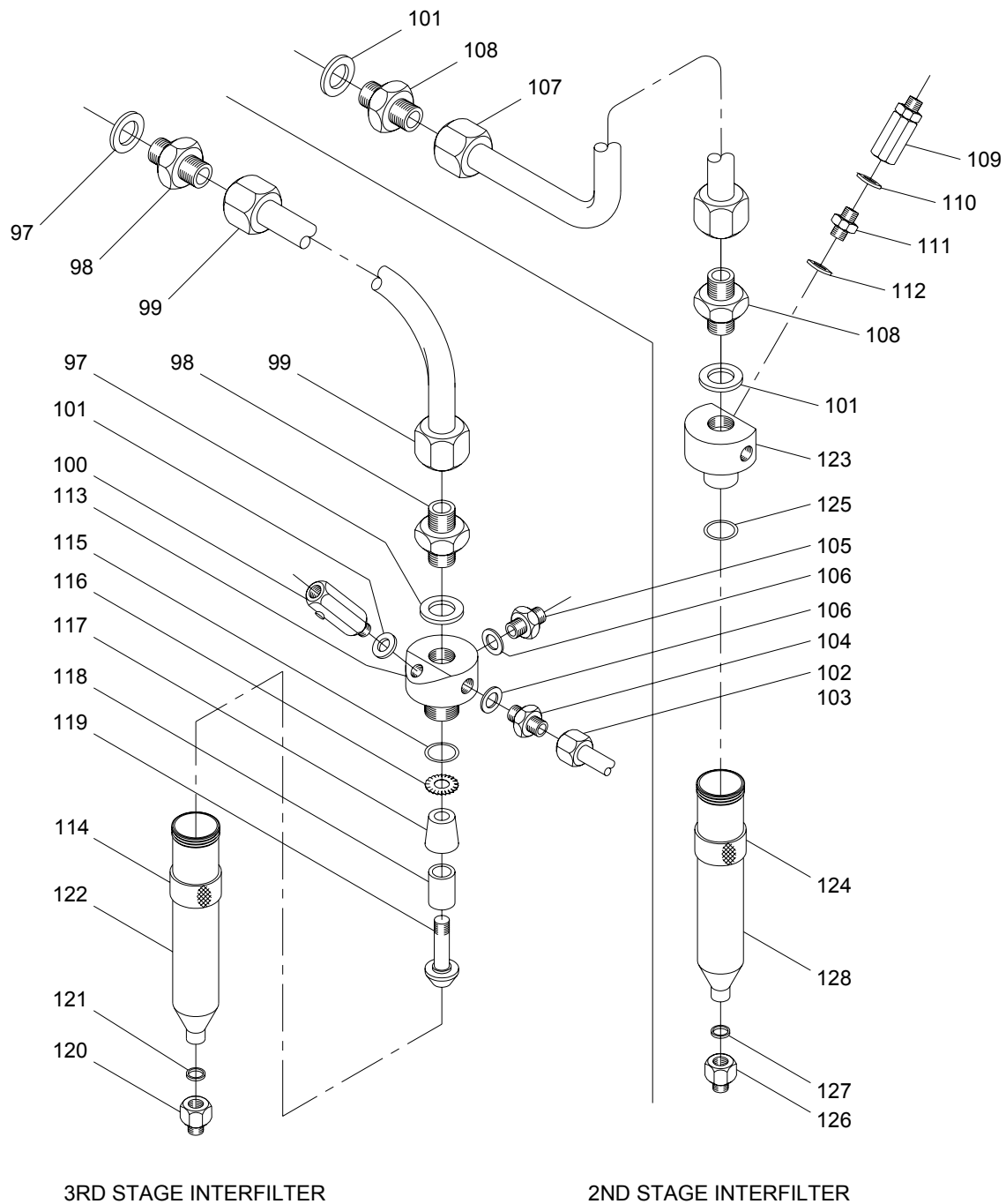


3RD STAGE INTERCOOLER ASSEMBLY

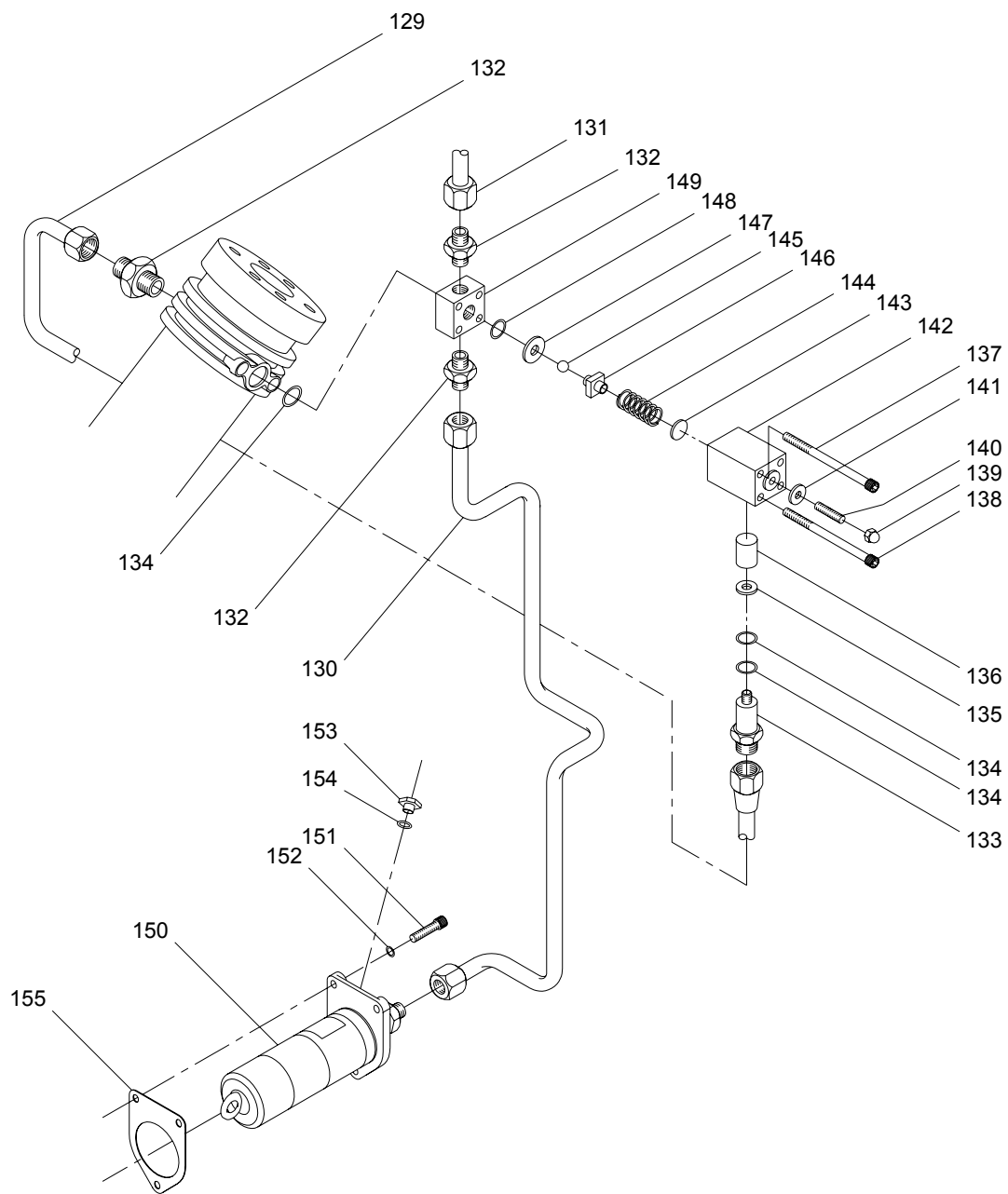
**Figure 7-2. Compressor Block Assembly (Sheet 3)**



**Figure 7-2. Compressor Block Assembly (Sheet 4)**

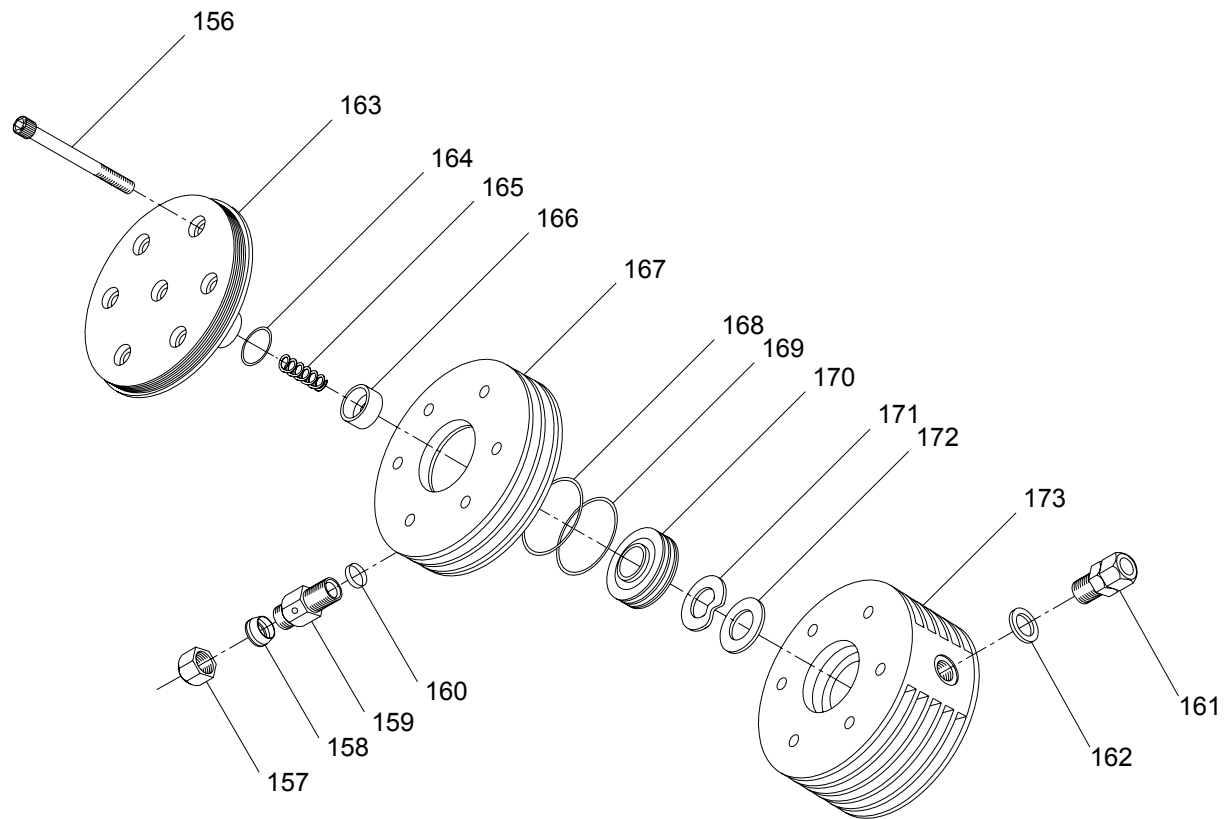


**Figure 7-2. Compressor Block Assembly (Sheet 5)**



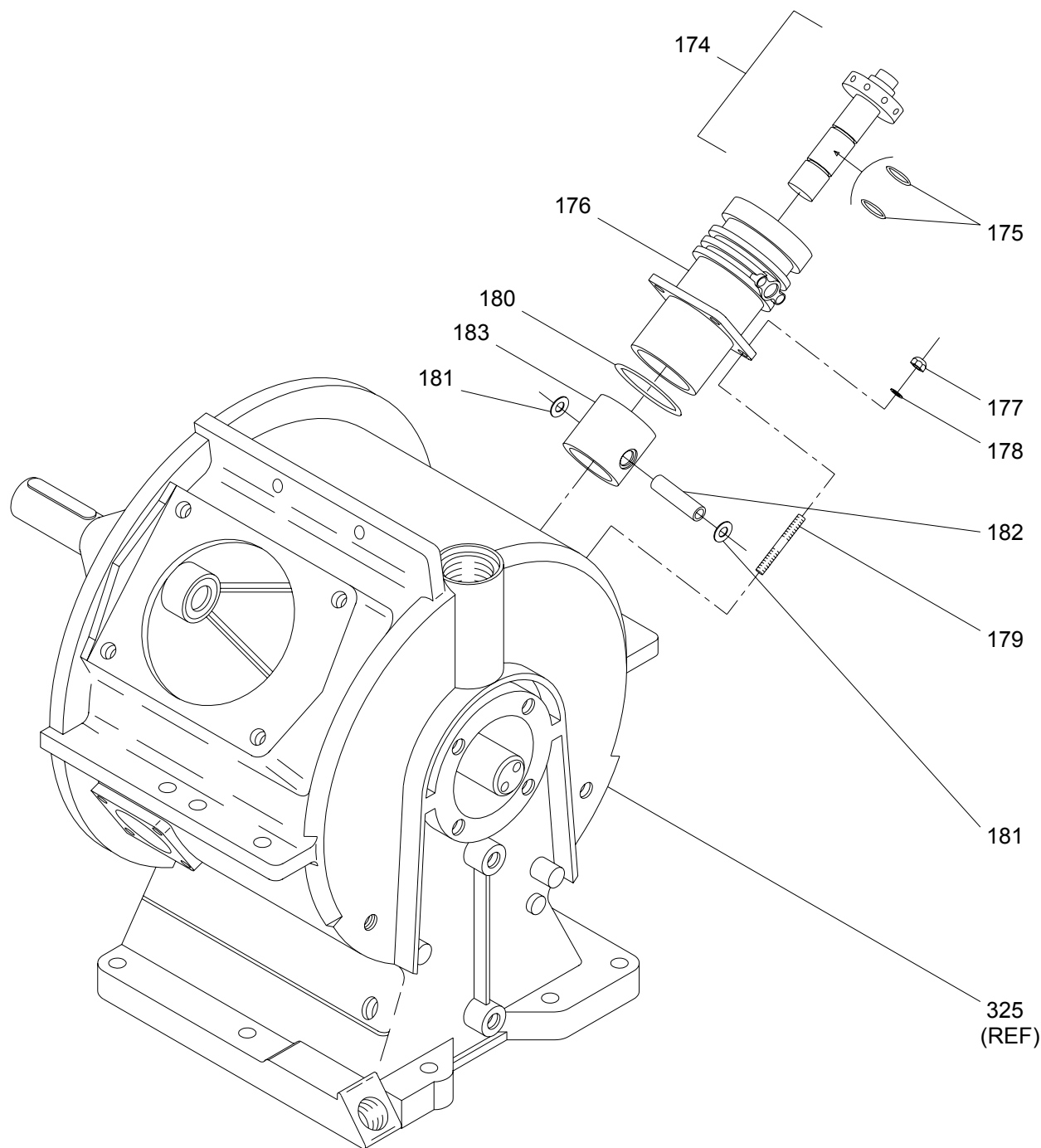
LUBRICATING SYSTEM

**Figure 7-2. Compressor Block Assembly (Sheet 6)**



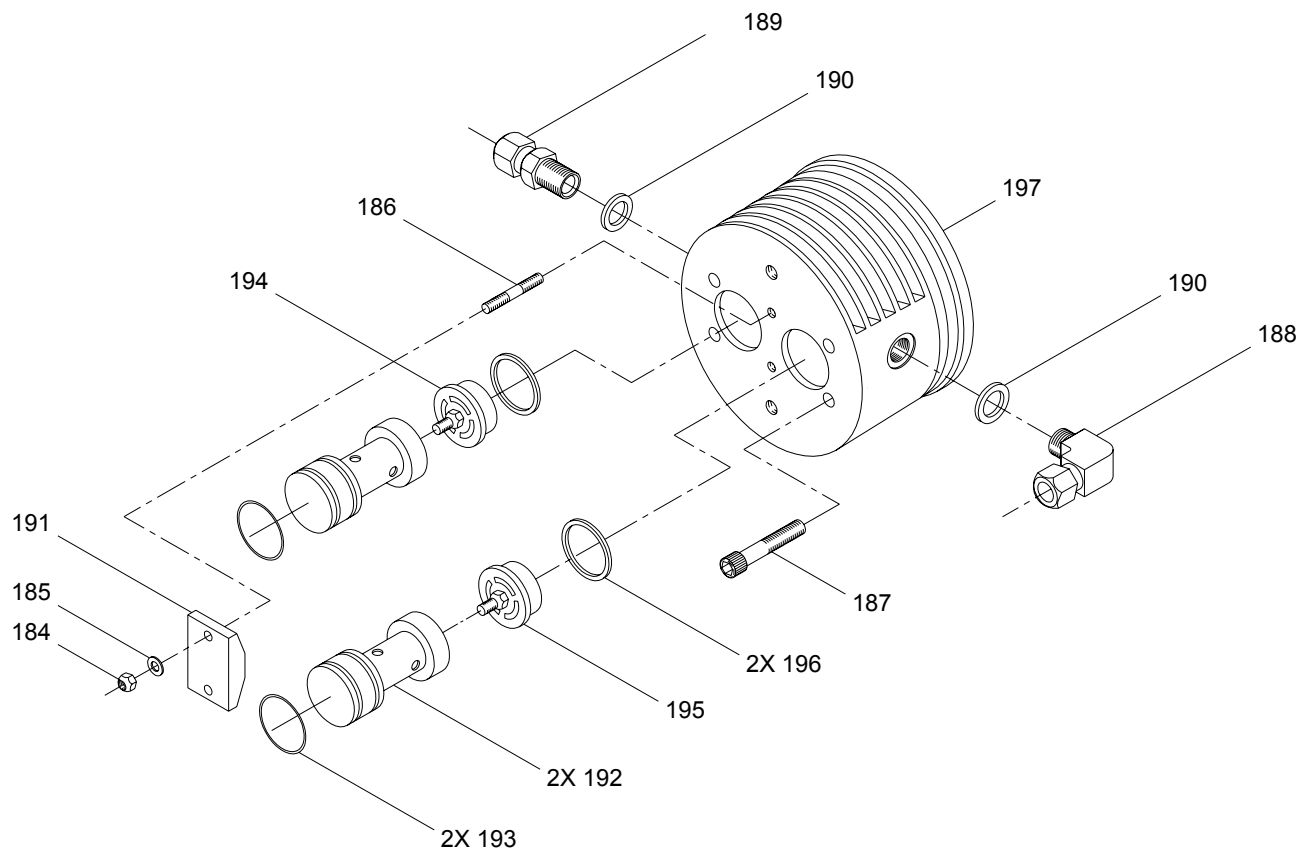
4TH STAGE VALVE HEAD

**Figure 7-2. Compressor Block Assembly (Sheet 7)**



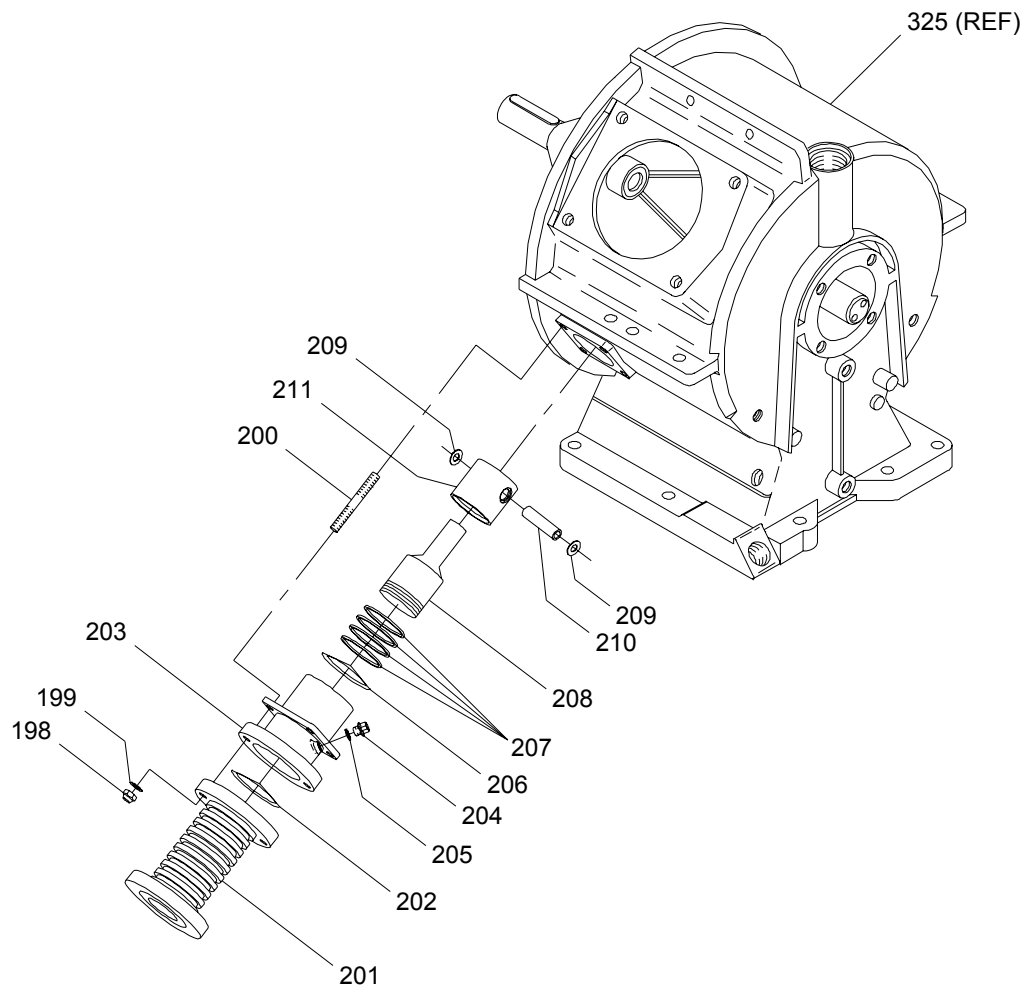
4TH STAGE PISTON AND CYLINDER ASSEMBLY

**Figure 7-2. Compressor Block Assembly (Sheet 8)**



3RD STAGE VALVE HEAD ASSEMBLY

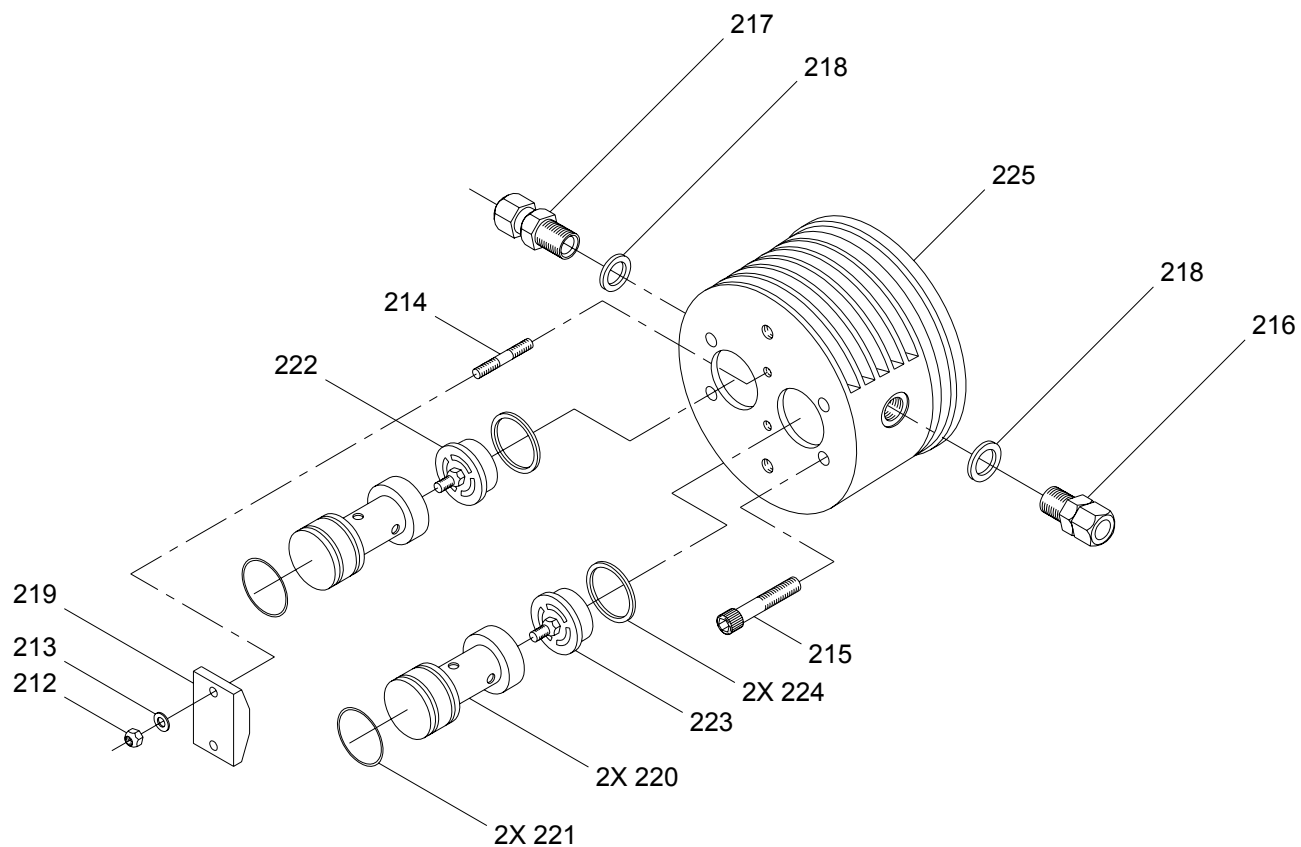
**Figure 7-2. Compressor Block Assembly (Sheet 9)**



3RD STAGE PISTON AND CYLINDER

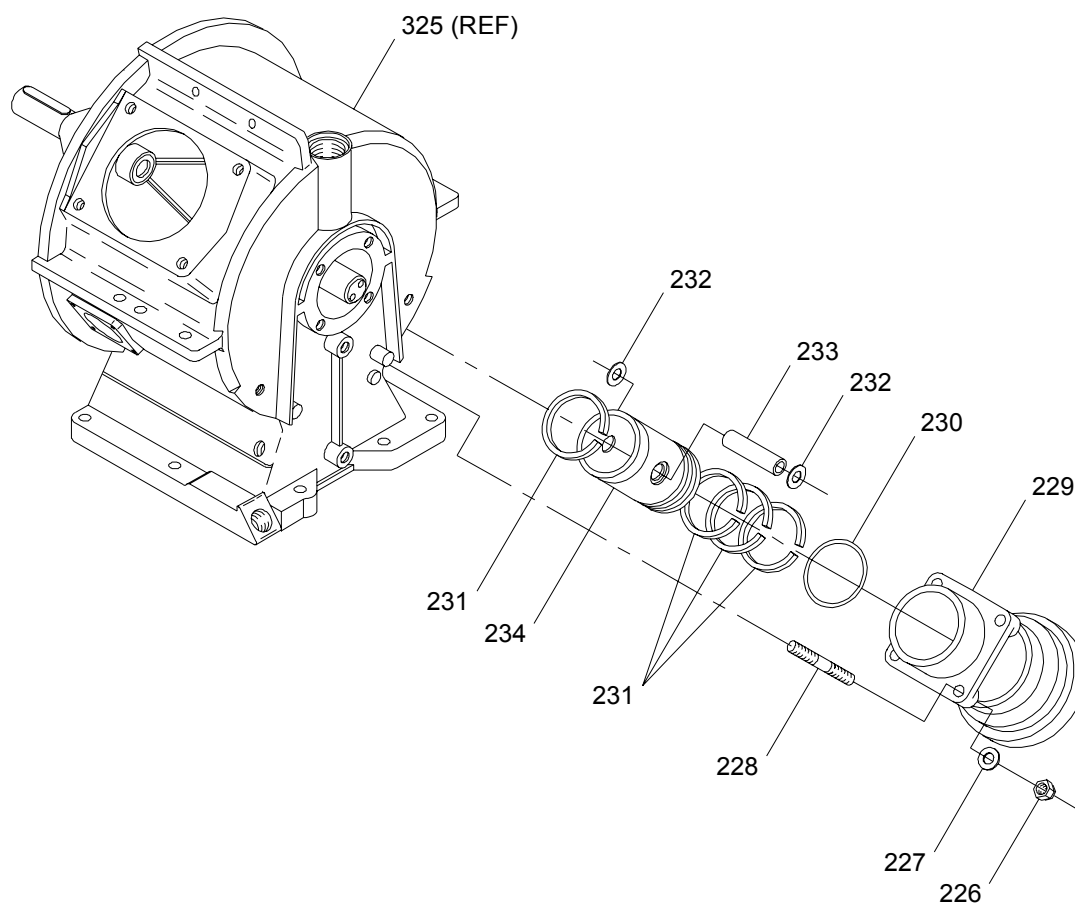
**Figure 7-2. Compressor Block Assembly (Sheet 10)**





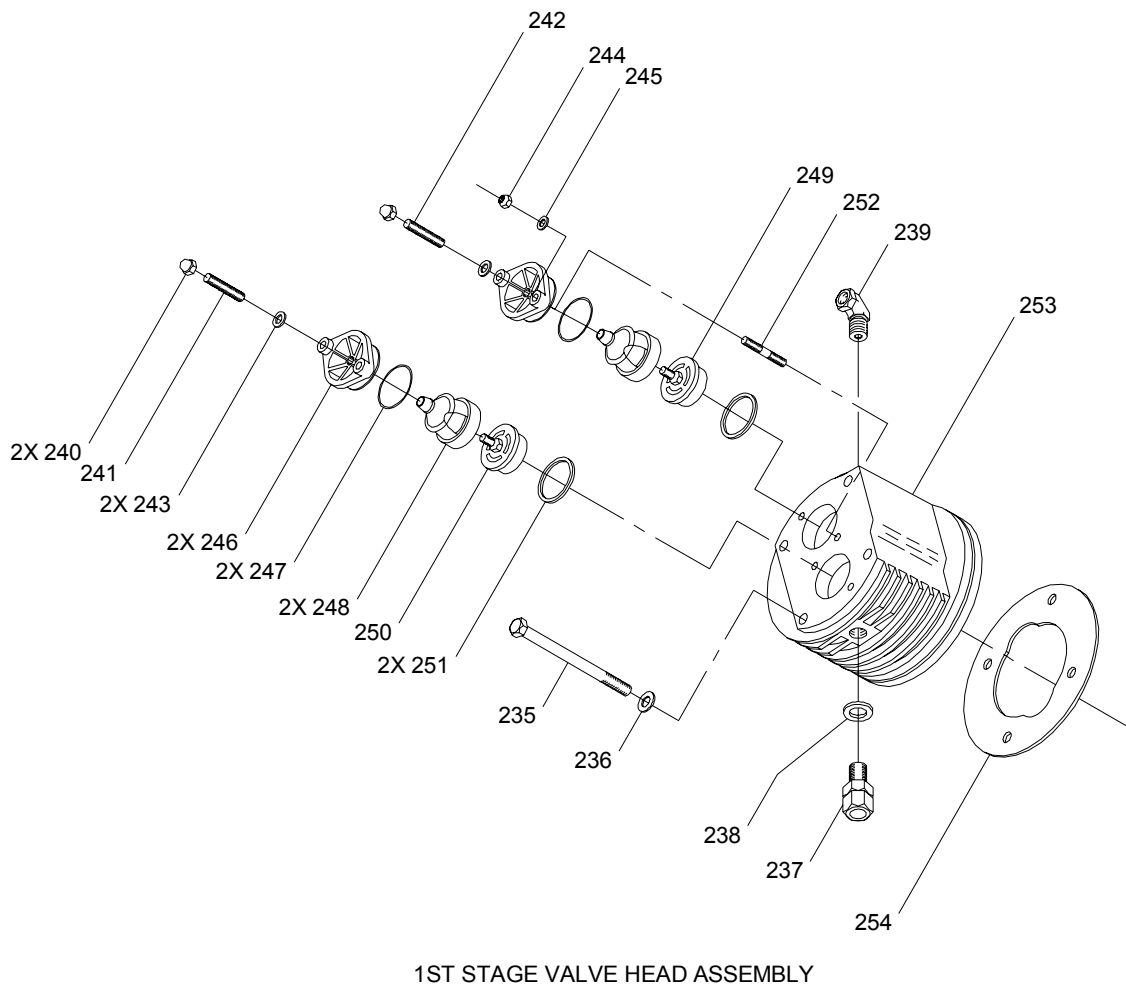
2ND STAGE VALVE HEAD ASSEMBLY

**Figure 7-2. Compressor Block Assembly (Sheet 11)**

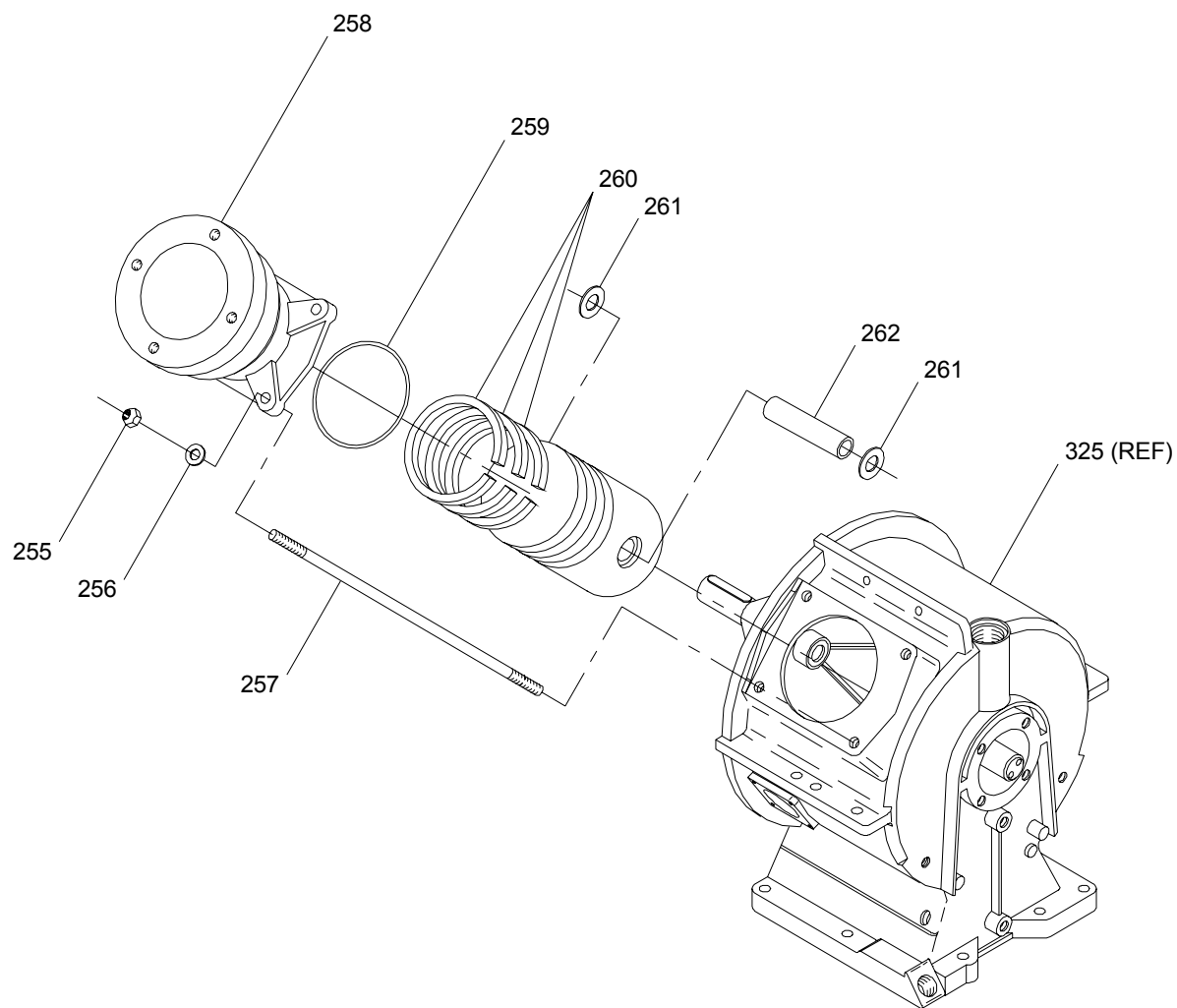


2ND STAGE PISTON AND CYLINDER ASSEMBLY

**Figure 7-2. Compressor Block Assembly (Sheet 12)**

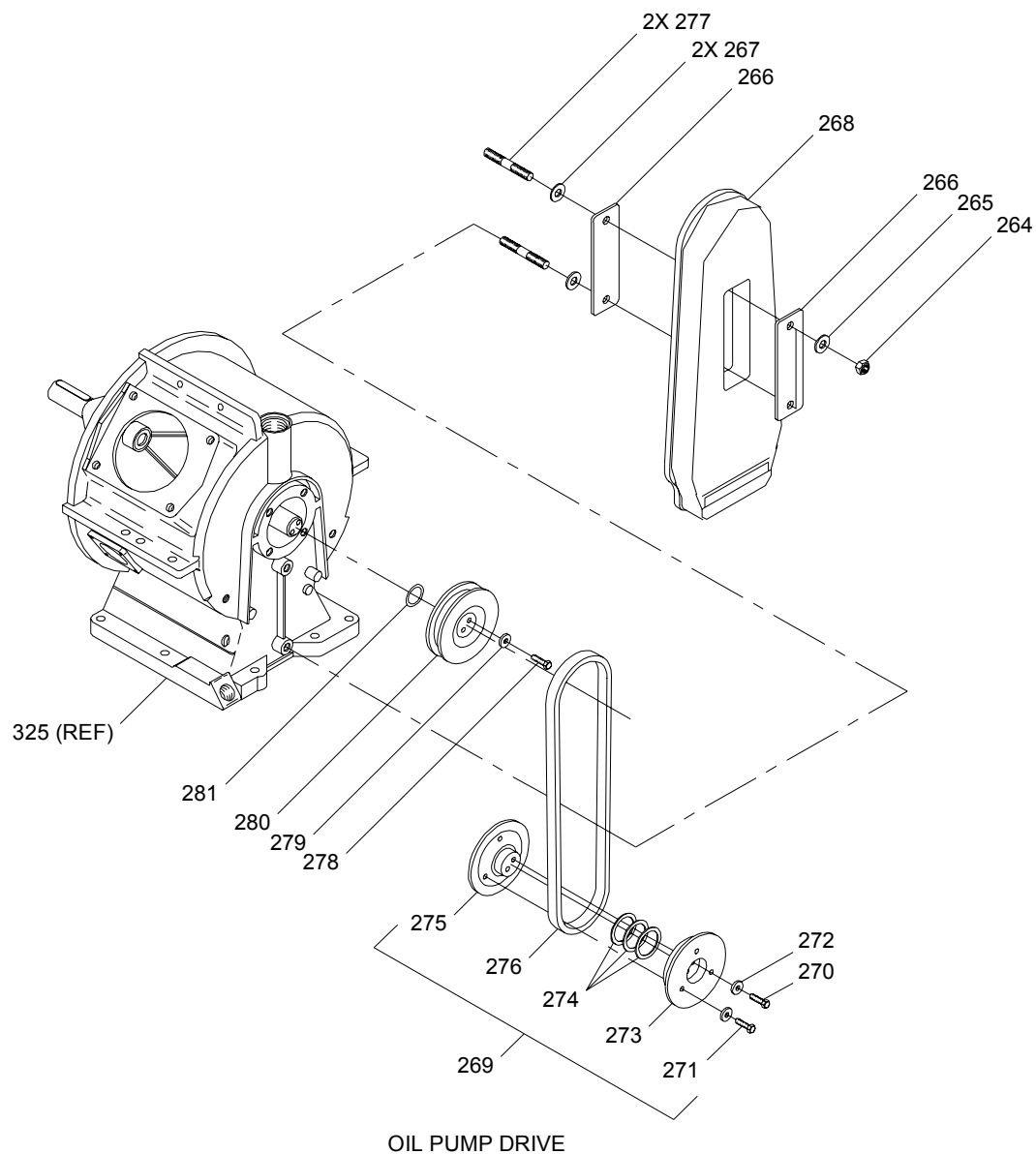


**Figure 7-2. Compressor Block Assembly (Sheet 13)**

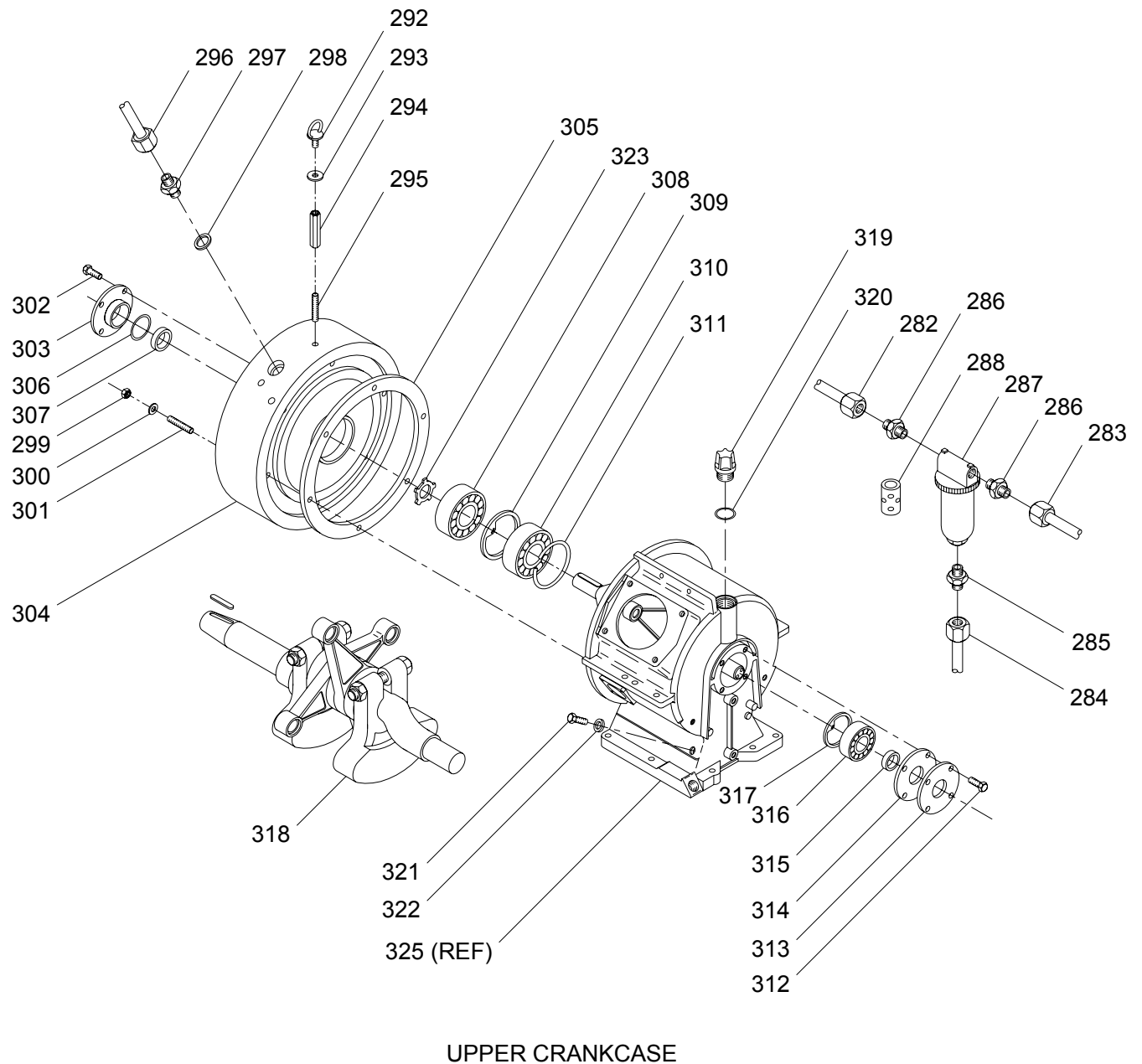


1ST STAGE PISTON AND CYLINDER ASSEMBLY

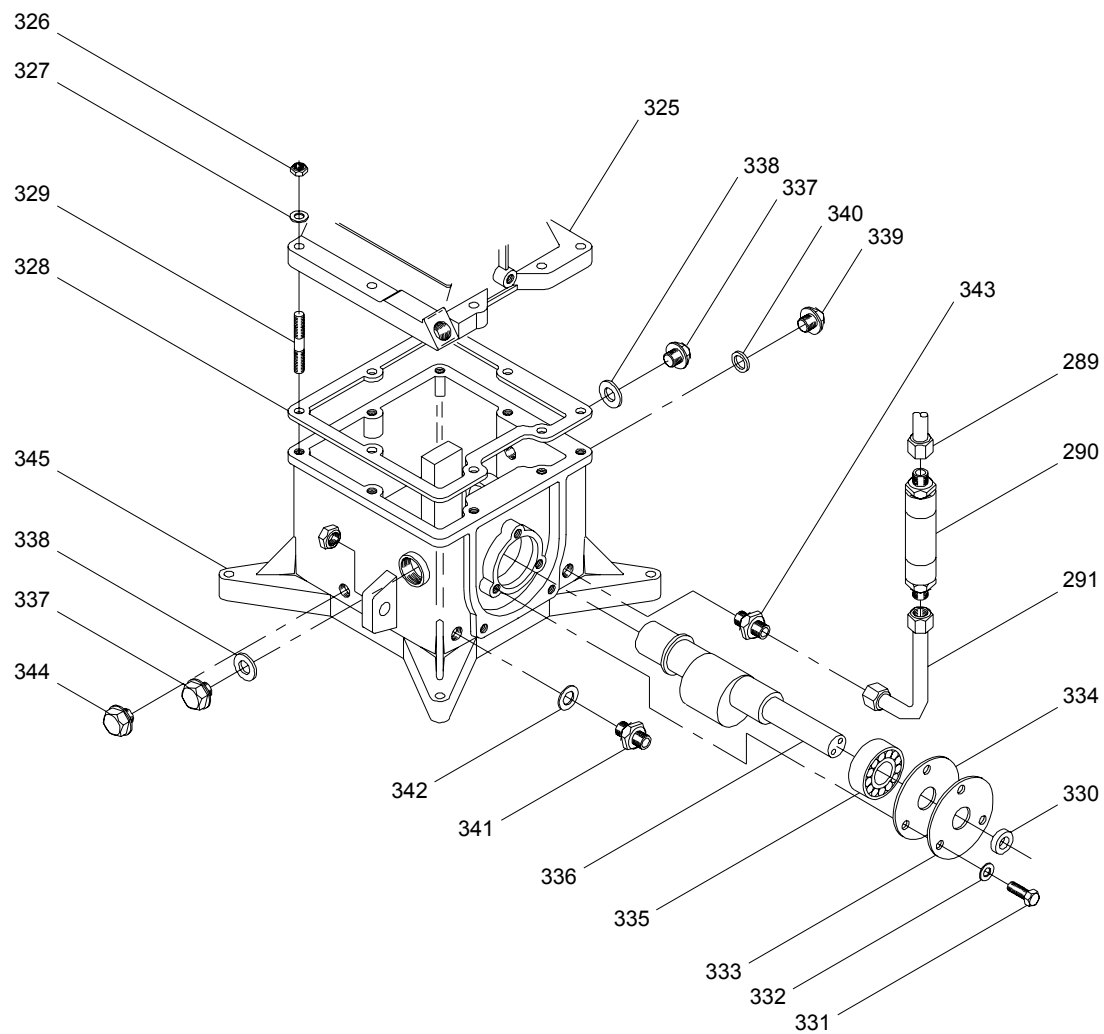
**Figure 7-2. Compressor Block Assembly (Sheet 14)**



**Figure 7-2. Compressor Block Assembly (Sheet 15)**



**Figure 7-2. Compressor Block Assembly (Sheet 16)**



**Figure 7-2. Compressor Block Assembly (Sheet 17)**

**Table 7-2. Compressor Block Assembly Parts List**

FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
7-2	Compressor Assembly, High Pressure Air (see Figure 7-1, Item 134)	REF		K966033-1
1	Nut, 8 mm S	1		K600129-32
2	Bite Ring, 8 mm S	1		K600129-33
3	Nut, 8 mm L	1		K600129-30
4	Bite Ring, 8 mm L			K600129-31
5	Nut, 8 mm L	1		K600129-28
6	Bite Ring, 8 mm L	1		K600129-29
7	Switch, Temperature, NC, Blue-Red, 320°F	1	57328	N03925
8	Not Used			
9	Filter Assembly, Intake	1	57328	073070
10	Cover, Housing, Filter (for illustration only)	1		No number
11	Fitting (Part of Item 10) (for illustration only)	1		No number
12	Insert, Filter	1	57328	N03029
13	Screw, Allen	3	57328	SCR-0050
14	Washer	3	57328	WAS-0024
15	Ring, Retaining (for illustration only)	1		No number
16	Housing, Filter (for illustration only)	1		No number
17	Manifold, Intake	1	57328	073057
	Attaching Parts			
18	Screw, Allen	2	57328	SCR-0040
	---*---			
19	O-ring	1	57328	N02485
20	Fitting, 1/2 ISO Parallel Male x 6mm Tube	1		400-082-092
21	Shroud, Cooling Fan	1	57328	060709
	Attaching Parts			
22	Capscrew, Hex Head	4	57328	SCR0001
23	Washer, Flat	4	57328	N02460
	---*---			
	Flywheel/Cooling Fan Assembly	1	57328	068669
	Attaching Parts (NOTE: Attaching parts removed to disassemble Belt Guard. See Figure 7-1, Items 127, 128, and 129)			
REF	Screw, Cap, Hex Head	REF	57328	SCR0111
REF	Washer, Lock, 1/4"	REF	57328	WAS0001
REF	Plate, Retaining	REF	57328	068646



**Table 7-2. Compressor Block Assembly Parts List - Continued.**

FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
	---*---			
24	Support, Fan Blade	6	57328	055425
	Attaching Parts			
25	Capscrew, Hex Head	12	57328	SCR0065
26	Washer, Split Lock	12	57328	WAS0029
	---*---			
27	Blade, Fan	18	57328	055460
28	Flywheel, Compressor	1	57328	068623
	Intercooler Assembly	1	57328	064450
	Attaching Parts			
29	Bracket, Mounting	2	57328	060751
30	Screw, Cap, Socket Head	4	57328	SCR0179
31	Nut, Hex	4	57328	NUT0062
32	Washer, Lock, 1/4"	10	57328	WAS0001
33	Screw, Cap, Socket Head	2	57328	SCR0136
34	Stud	8	57328	N03494
35	Nut, Hex , Self-Locking	8	57328	NUT0118
36	Washer, Flat	8	57328	WAS0024
	---*---			
37	Intercooler (with attaching fittings)	1	57328	064450
38	Clamp, Tube	6	57328	060738
39	Screw, Cap, Socket Head	7	57328	SCR0133
40	Washer, Flat	14	57328	WAS0024
41	Nut, Lock, Hex	7	57328	NUT0118
42	Clamp	4	57328	060694-M
43	Screw, Countersunk	2	57328	N15119
44	Nut, Hex	2	57328	NUT-0067
	Intercooler Assembly	1	57328	064449
45	Intercooler Assembly	1	57328	064449
46	Clamp, Tube	6	57328	060738
47	Screw, Allen	7	57328	SCR0133
48	Nut, Hex, Self-Locking	7	57328	NUT0118
49	Washer	14	57328	WAS0024
50	Nut, Hex, Self-Locking	2	57328	N01042
51	Washer	4	57328	N03313

**Table 7-2. Compressor Block Assembly Parts List - Continued.**

FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
52	Clamp	8	57328	60694M
53	Stud	4	57328	N03494
54	Screw, Allen	2	57328	SCR-0180
55	Nut, Hex, Self-Locking	2	57328	NUT-0119
56	Washer	4	57328	WAS-0021
57	Mounting	1	57328	068889
58	Screw, Countersunk	12	57328	N15414
59	Nut, Hex, Self-Locking	12	57328	NUT0119
60	Washer, Flat	12	57328	WAS0021
61	Clamp	12	57328	060694
62	Screw, Allen	4	57328	SCR0179
63	Screw, Allen	4	57328	SCR0136
64	Nut, Hex	4	57328	NUT0062
65	Washer, Lock, 1/4"	8	57328	WAS0001
66	Mounting	1	57328	060695
	Cooler Assembly, Auxiliary, 1st Stage	1	57328	
67	Fitting, Stainless	1	57328	N25448
68	Tube, Connecting (with attaching fittings)	1	57328	078226
69	Fitting, Stainless	1	57328	N20487
70	Plug, Tube	1	57328	PLU0095
71	Capscrew	1	57328	N15902
72	Fitting, Stainless	1	57328	N02309
73	Tube, Connecting (with attaching fittings)	1	57328	TUBR0013
74	Fitting, Stainless	1	57328	078434
75	Screw, Countersunk	2	57328	N15119
76	Nut, Hex, Self-Locking	2	57328	NUT-0062
77	Clamp	4	57328	60694-M
78	Cooler, Auxiliary, 1st Stage (with attaching fittings)	1	57328	078277
	Aftercooler Assembly	1	57328	070047
79	Connector, Tube, Stainless	1	57328	071148
80	Elbow	1	57328	ELL0230
81	Aftercooler (with attaching fittings)	1	57328	070047
82	Intercooler, 1st Stage (with attaching fittings)	1	57328	070039
83	Capscrew, Socket Head	2	57328	SCR0179
84	Washer, Wave	2	57328	N02144

**Table 7-2. Compressor Block Assembly Parts List - Continued.**

FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
85	Support, Filter	2	57328	057070
86	Bracket, Mounting	2	57328	060716
	Attaching Parts			
87	Capscrew, Socket Head	2	57328	SCR0133
	---*---			
88	Valve, Safety	1	57328	010255
89	Gasket, Copper	1	57328	008263
90	Connector, Male	1	57328	CON0190
91	Gasket, Copper	1	57328	N01316
92	Connector, Male	1	57328	CON0041
93	Gasket, Copper	1	57328	N01316
94	Connector, Male	1	57328	N15072
95	Gasket, Copper	1	57328	N01316
96	Manifold	1	57328	060717
97	Gasket	4	57328	N01316
98	Fitting, Stainless	2	57328	N20597
99	Tube, Connecting	1	57328	078232
100	Valve, Safety, 3rd Stage	1	57328	014280
	Valve, Safety, 3rd Stage (optional to 014280)	1	57328	012886
101	Gasket	2	57328	004479
102	Plug, Stainless	2	57328	N15843
103	Capscrew, Stainless	2		
104	Fitting, Stainless	2	57328	N20083
105	Fitting, Stainless	2	57328	N20488
106	Gasket	4	57328	N00293
107	Tube, Connecting	1	57328	078230
108	Fitting, Stainless	2	57328	N20488
109	Valve, Safety, 2nd Stage	1	57328	010253
110	Gasket		57328	008264
111	Connector, Male	1	57328	N20491
112	Gasket	1	57328	004479
	Inter-Filter, 3rd Stage	1	57328	066523
113	Head, Filter	1	57328	060602
114	Collar, Threaded	1	57328	013937
115	O-ring	1	57328	N03556

**Table 7-2. Compressor Block Assembly Parts List - Continued.**

FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
116	Plate, Vortex	1	57328	012784
117	Cone, Baffle	1	57328	012785
118	Element, Filter	1	57328	N02726
119	Screw, Center	1	57328	012786
120	Fitting, Stainless	1	57328	N25447
121	Gasket		57328	N01316
122	Housing, Filter (order together with PN 60602, Item 113)	1	57328	014150
	Inter-Filter, 2nd Stage	1	57328	066522
123	Head, Filter	1	57328	060601
124	Collar, Threaded	1	57328	013937
125	O-ring	1	57328	N03556
126	Fitting, Stainless	1	57328	N25447
127	Gasket	1	57328	N01316
128	Housing, Filter (for illustration only)	1	57328	014150
	Lubrication System Assembly	1	57328	078235
129	Tube, Oil Return	1	57328	070063
130	Tube, Oil Supply	1	57328	070064
131	Plug, Tube	1	57328	N04530
132	Connector, Male, with seal	3	57328	CON0076
133	Fitting, Oil Sight Glass	1	57328	056301
134	O-ring	2	57328	N07091
135	Gasket, Copper	1	57328	N04051
136	Tube, Glass	1	57328	056302
	Regulator Assembly, Oil Pressure	1	57328	058138
	Attaching Parts			
137	Capscrew, Socket Head	2	57328	N03407
138	Capscrew, Socket Head	2	57328	SCR0177
	---*---			
139	Nut, Dome	1	57328	N00084
140	Set Screw, Slotted	1	57328	N02969
141	Gasket, Copper	1	57328	N03625
142	Body, Regulator Valve (not procurable; purchase NHA)	1	57328	058102
143	Plate, Valve (not procurable; purchase NHA)	1	57328	058121

**Table 7-2. Compressor Block Assembly Parts List - Continued.**

FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
144	Spring, Compression	1	57328	002623
	Seat Assembly, Valve	1	57328	072439
145	Ball, Precision	1	57328	N02769
146	Guide, Ball (not procurable; purchase NHA)	1	57328	002622
147	Seat, Valve (not procurable; purchase NHA)	1	57328	No number
148	O-ring	2	57328	N07091
149	Flange, Square (not procurable; purchase NHA)	1	57328	057132
150	Pump, Oil	1	57328	N00083
	Attaching Parts			
151	Capscrew, Socket Head	3	57328	SCR0136
152	Washer, Flat	3	57328	WAS0021
	---*---			
153	Capscrew, Hex Head	1	57328	SCR0197
154	Gasket, Copper	1	57328	N01059
155	Gasket, Oil Pump	1	57328	002010
	Head Assembly, Valve, 4th Stage	1	57328	070032
	Attaching Parts			
156	Capscrew, Socket Head	6	57328	SCR0062
	---*---			
157	Nut, Tube	1	57328	NUT0013
158	Ferrule	1	57328	FER0003
159	Fitting, Thermowell	1	57328	066306
160	Gasket, Copper	1	57328	056983
161	Connector, Male	1	57328	N15400
162	Gasket, Copper	1	57328	N01316
163	Limiter, Stroke	1	57328	060537
	Valve Assembly, Inlet/Discharge	1	57328	064153
164	O-ring	1	57328	N04385
165	Spring, Compression (not procurable; purchase NHA)	1	57328	No number
166	Plate, Discharge Valve (not procurable; purchase NHA)	1	57328	No number
167	Head, Discharge Valve	1	57328	060534
168	Ring, Back-Up	1	57328	N15411
169	O-ring	1	57328	N04776

**Table 7-2. Compressor Block Assembly Parts List - Continued.**

FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
170	Seat, Discharge Valve (not procurable; purchase NHA)	1	57328	No number
171	Washer, Wave (not procurable; purchase NHA)	1	57328	No number
172	Plate, Inlet Valve (not procurable; purchase NHA)	1	57328	No number
173	Head, Inlet Valve	1	57328	060530
	Piston and Cylinder Assembly, 4th Stage	1	57328	070020
174	Piston Assembly (available only as an assembly, includes O-ring, Item 175)	1	57328	061050
175	O-ring	2	57328	N02320
176	Cylinder, Stepped	1	57328	060533
	Attaching Parts			
177	Locknut, Hex	4	57328	NUT0119
178	Washer, Flat	4	57328	WAS0021
179	Stud	4	57328	N00215
	---*---			
180	O-ring	1	57328	N03731
181	Ring, Retaining	2	57328	N01665
182	Pin, Piston (not procurable; purchase 183)	1	57328	----
183	Piston, Guide	1	57328	070012
	Head Assembly, Valve, 3rd Stage	1	57328	061056
	Attaching Parts			
184	Locknut, Hex	2	57328	NUT0128
185	Washer, Flat	2	57328	WAS0031
186	Stud	2	57328	N04190
187	Capscrew, Socket Head	6	57328	SCR0180
	---*---			
188	Elbow, Male	1	57328	ELL0060
189	Connector, Male		57328	CON0191
190	Gasket, Copper	2	57328	N00293
191	Pad, Press	1	57328	062924
192	Hood, Valve	2	57328	056183
193	O-ring	1	57328	N03997
194	Valve, Inlet	1	57328	N15273
195	Valve, Discharge	1	57328	N15274
196	Gasket, Valve	2	57328	056668
197	Head, Valve	1	57328	060583

**Table 7-2. Compressor Block Assembly Parts List - Continued.**

FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
	Piston and Cylinder Assembly, 3rd Stage	1	57328	060107
	Attaching Parts			
198	Locknut, Hex	4	57328	NUT0119
199	Washer, Flat	4	57328	WAS0021
200	Stud	4	57328	N17462
	---*---			
201	Cylinder, Piston	1	57328	067061
202	O-ring	1	57328	N07063
203	Cylinder, Guide	1	57328	067057
204	Pipe Plug, Hex	1	57328	PLU0028
205	Gasket, Copper	1	57328	N04051
206	O-ring	1	57328	N03731
207	Ring Set, Piston	1	57328	N16313
208	Piston, Floating	1	57328	070013
209	Ring, Retaining	2	57328	N01665
210	Pin, Piston (not procurable; purchase 211)	1	573286	----
211	Piston, Guide	1	57328	070012
	Head Assembly, Valve, 2nd Stage	1	57328	
	Attaching Parts			
212	Locknut, Hex	2	57328	NUT0128
213	Washer, Flat	2	57328	WAS0031
214	Stud	2	57328	N04190
215	Capscrew, Socket Head	6	57328	SCR0180
	---*---			
216	Connector, Male	1	57328	CON0191
217	Connector, Male	1	57328	N15401
218	Gasket, Copper	2	57328	N00293
219	Pad, Press	1	57328	062924
220	Hood, Valve	2	57328	056183
221	O-ring	2	57328	N03997
222	Valve, Inlet	1	57328	N04067
223	Valve, Discharge	1	57328	N04068
224	Gasket, Valve	2	57328	056668
225	Head, Valve	1	57328	060583
	Piston and Cylinder Assembly, 2nd Stage	1	57328	061048

**Table 7-2. Compressor Block Assembly Parts List - Continued.**

FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
	Attaching Parts			
226	Locknut, Hex	4	57328	NUT0119
227	Washer, Flat	4	57328	WAS0021
228	Stud	4	57328	N00215
	---*---			
229	Cylinder, Piston	1	57328	060572
230	O-ring	1	57328	N03731
231	Ring Set, Piston	1	57328	N01461
232	Ring, Retaining	2	57328	N00484
233	Pin, Piston (not procurable; purchase 234)	1	57328	----
234	Piston	1	57328	070010
	Head Assembly, Valve, 1st Stage	1	57328	061181
	Attaching Parts			
235	Cap Screw, Socket Head		57328	N15410
236	Washer, Flat	4	57328	WAS0031
	---*---			
237	Connector, Male	1	57328	N15401
238	Gasket, Copper	1	57328	N00293
239	Elbow, Male	1	57328	ELL0061
240	Elbow, Male (optional to ELL061)	1	57328	ELL0121
241	Dome Nut	2	57328	N00309
242	Set Screw, Socket	1	57328	N04102
243	Set Screw, Socket	1	57328	N02741
244	Gasket, Copper	2	57328	N01316
245	Locknut, Hex	4	57328	NUT0128
246	Washer, Flat	4	57328	WAS0031
247	Cover, Valve	2	57328	061035
248	O-ring	2	57328	N04085
249	Hood, Valve	2	57328	060233
250	Valve, Inlet	1	57328	N02975
251	Valve, Discharge	1	57328	N04149
252	Gasket, Valve	2	57328	005298
253	Stud	4	57328	N04605
254	Head, Valve	1	57328	060991
255	Gasket, Valve Head	1	57328	061183



**Table 7-2. Compressor Block Assembly Parts List - Continued.**

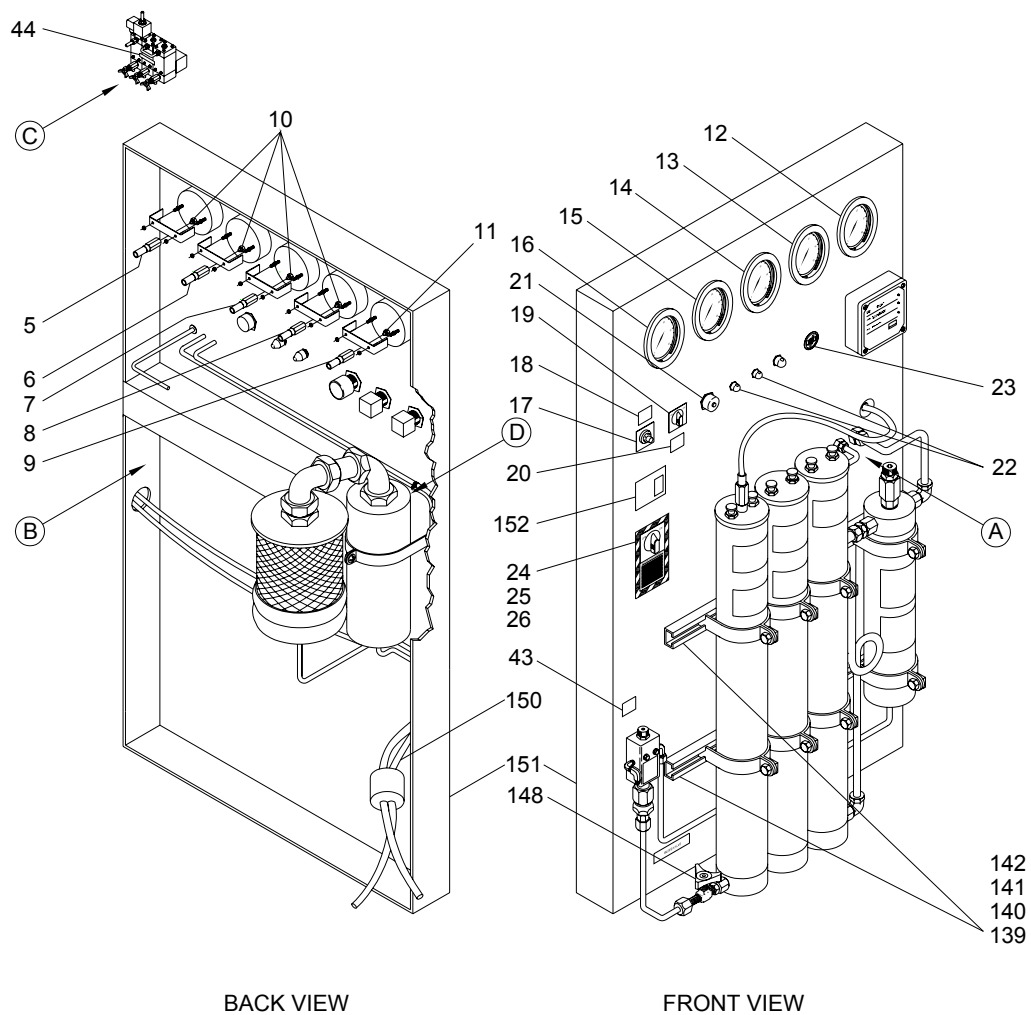
FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
256	Piston and Cylinder Assembly, 1st stage	1	57328	061178
	Attaching Parts			
257	Stud	4	57328	N15424
	---*---			
258	Cylinder, Piston	1	57328	061179
259	O-ring	1	57328	N02621
260	Ring Set, Piston	1	57328	N04642
261	Ring, Retaining	2	57328	N00484
262	Pin, Piston (not procurable; purchase 263)	1	57328	----
263	Piston	1	57328	070067
	Upper Crankcase Assembly	1	57328	056535
264	Locknut, Hex	2	57328	NUT0119
265	Washer, Flat	2	57328	WAS0021
266	Cover Plate, Belt Guard	2	57328	069681
267	Washer, Flat	2	57328	N02862
268	Guard, Belt	1	57328	069540
269	Sheave, V-Belt, adjustable	1	57328	013093
	Attaching Parts			
270	Capscrew, Socket Head	2	57328	SCR0145
271	Capscrew, Socket Head	3	57328	N03158
272	Washer, Split Lock	5	57328	N01313
	---*---			
273	Plate, Sheave, Front	1	57328	013092
274	Disc, Spacer	AR	57328	N03159
275	Plate, Sheave, Rear	1	57328	013092
276	V-Belt	1	57328	BET0136
277	Stud	2	57328	N03497
278	Capscrew, Socket Head	2	57328	SCR0136
279	Washer, Split Lock	2	57328	N00654
280	Sheave, V-Belt	1	57328	060118
281	O-ring	1	57328	N15106
282	Vent System, Crankcase	1	57328	069240
283	Tube, Round (Specify length on order)	1	57328	TUBR0021
284	Tube, Round (Specify length on order)	1	57328	TUBR0021
285	Tube, Round (Specify length on order)	1	57328	TUBR0013

**Table 7-2. Compressor Block Assembly Parts List - Continued.**

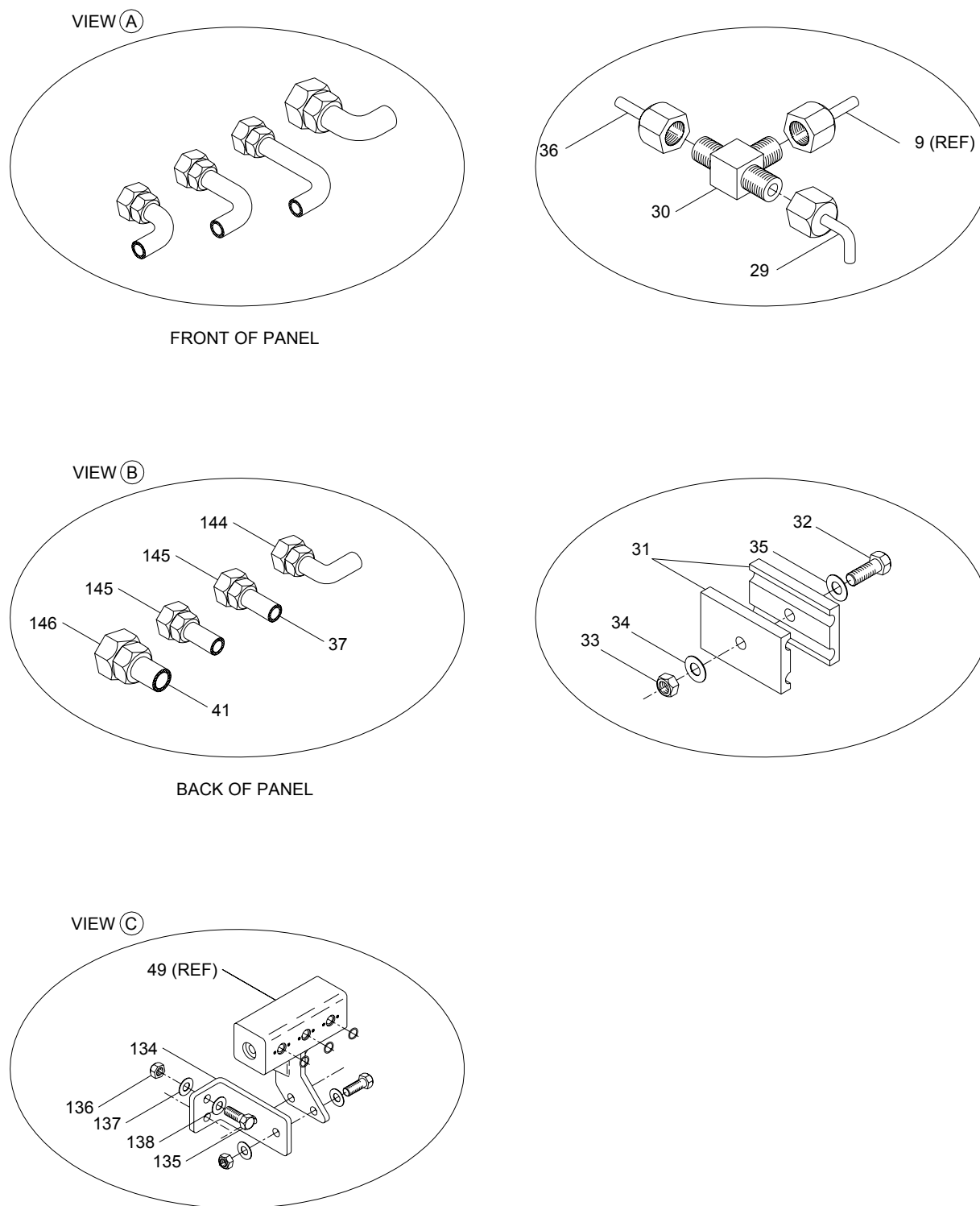
FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
286	Connector, Male	1	57328	CON0029
287	Connector, Male, with seal	2	57328	CON00147
	Combination Separator Trap/Drain	1	57328	N03758
288	Housing, Separator	1	57328	N15491
289	Insert, Separator	1	57328	057341
290	Tube Assembly	1	57328	078217
	Sight Glass Assembly, Oil	1	57328	074574
291	Tube Assembly	1	57328	078218
292	Eye Bolt	1	57328	N04467
293	Washer, Flat	1	57328	001492
294	Bushing, Hex	1	57328	061068
295	Stud	1	57328	N04150
296	Tube, Round (Specify length on order)	1	57328	TUBR0021
297	Connector, Male	1	57328	061043
298	Gasket, Copper	1	57328	N00293
299	Locknut, Hex	6	57328	NUT0119
300	Washer, Flat	6	57328	WAS0021
301	Stud	6	57328	N03138
	Stud (optional to N03138)	6	57328	070248
302	Screw, Flat Head, Slotted, Countersunk	4	57328	N03680
	Screw, Flat Head, Socket (optional to N03680)	4	57328	N20649
303	Cover, Bearing	1	57328	068586
304	Cover, Bearing	1	57328	068585
305	Gasket, Bearing cover	1	57328	003177
306	O-ring	1	57328	N15093
307	Seal, Shaft	1	57328	N18305
308	Bearing, Roller	1	57328	N18303
309	Ring, Retaining	1	57328	N03810
310	Bearing, Roller	1	57328	N18304
311	Ring, Retaining	1	57328	N18432
312	Capscrew, Socket Head	4	57328	SCR0143
313	Cover, Bearing	1	57328	059784
314	Gasket, Bearing Cover	1	57328	003733
315	Seal, Shaft	1	57328	N15067
316	Bearing, Roller	1	57328	N02638

**Table 7-2. Compressor Block Assembly Parts List - Continued.**

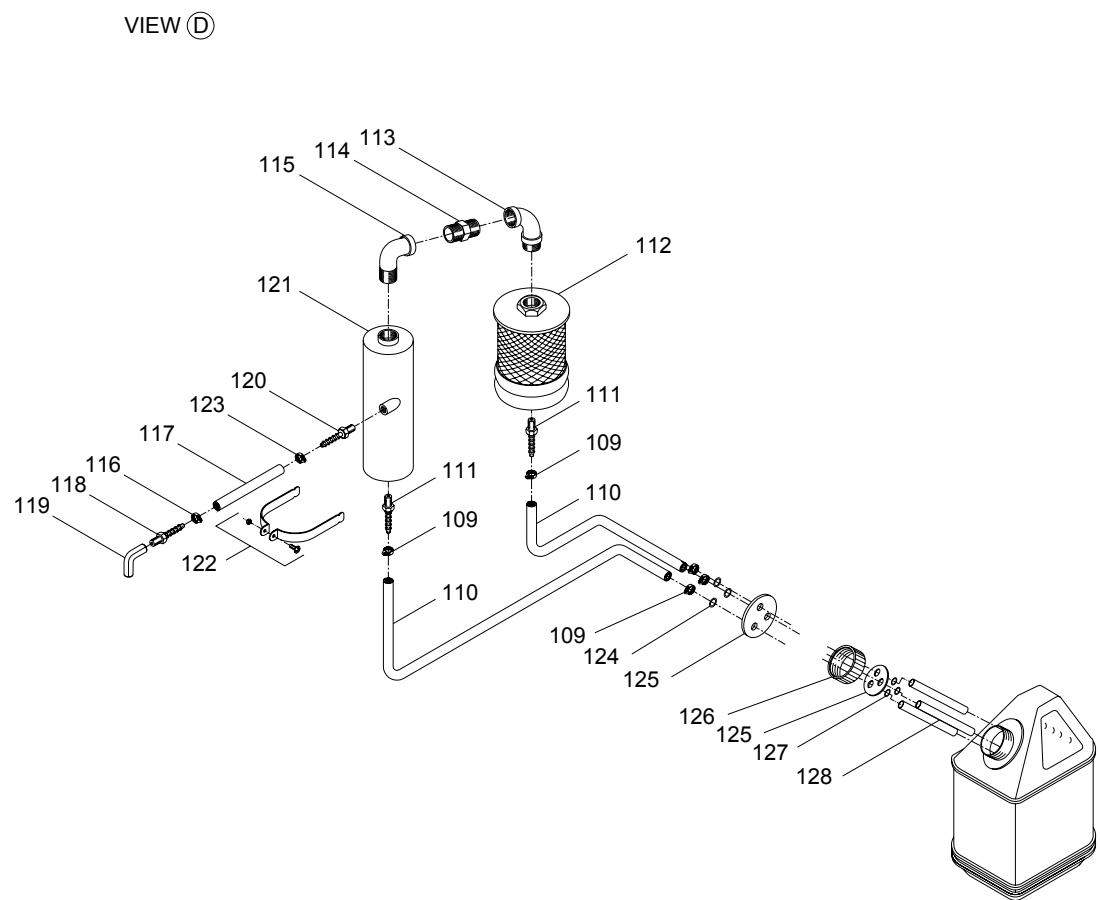
FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
317	Ring, Retaining	1	57328	N02635
	Crankshaft Assembly	1	57328	069344
318	Crankshaft	1	57328	069344
319	Cap, Oil Filler	1	57328	061054
320	O-ring	1	57328	N15412
321	Screw, Allen	3	57328	N15121
322	Gasket, Copper	3	57328	N01316
323	Snap Ring	1	57328	N18310
324	Not Used			
325	Crankcase, Upper	1	57328	056535
	Attaching Parts			
326	Locknut, Hex	8	57328	NUT0119
327	Washer, Flat	8	57328	WAS0021
328	Gasket, Crankcase	1	57328	012386
329	Stud	8	57328	N00085
	---*---			
330	Seal, Shaft	1	57328	N00086
331	Screw, Cap, Hex Head	3	57328	SCR0065
332	Washer, Flat	3	57328	WAS0024
333	Cover, Bearing	1	57328	005348
334	Gasket, Cover, Bearing	1	57328	000149
335	Bearing, Ball	1	57328	N00091
336	Camshaft	1	57328	004704
337	Plug, Pipe, Hex Head	2	57328	PLU0040
338	Gasket, Copper	2	57328	N04261
339	Plug, Pipe, Hex Head	1	57328	N02447
340	Gasket, Copper	1	57328	N00293
341	Connector, Male	1	57328	N03338
342	Gasket, Copper	1	57328	N00842
343	Fitting, Stainless	1		N25487
344	Plug, Pipe, Hex Head	1	57328	N03707
345	Crankcase, Lower	1	57328	058120



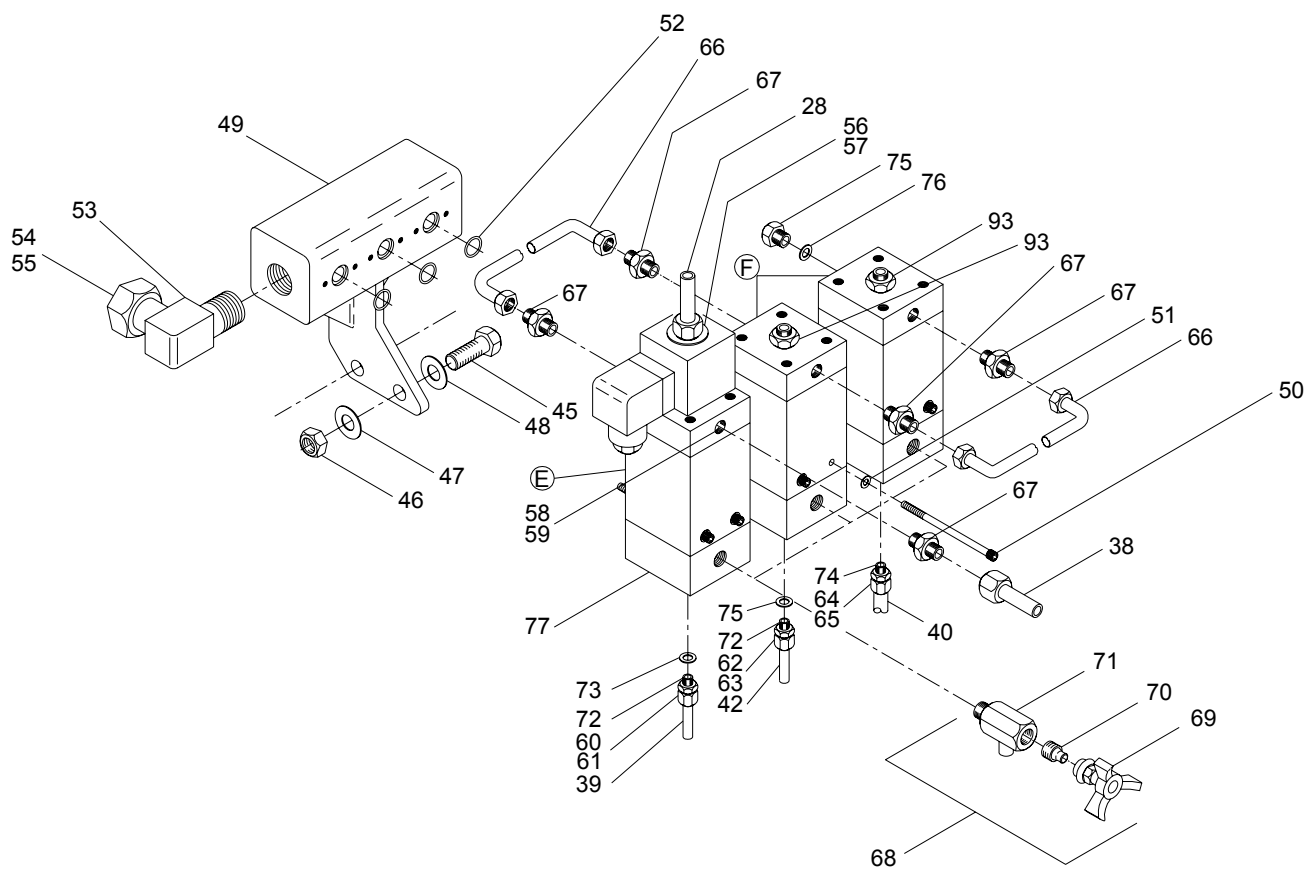
**Figure 7-3. HPBAC Instrument and Control Panel (Sheet 1 of 5)**



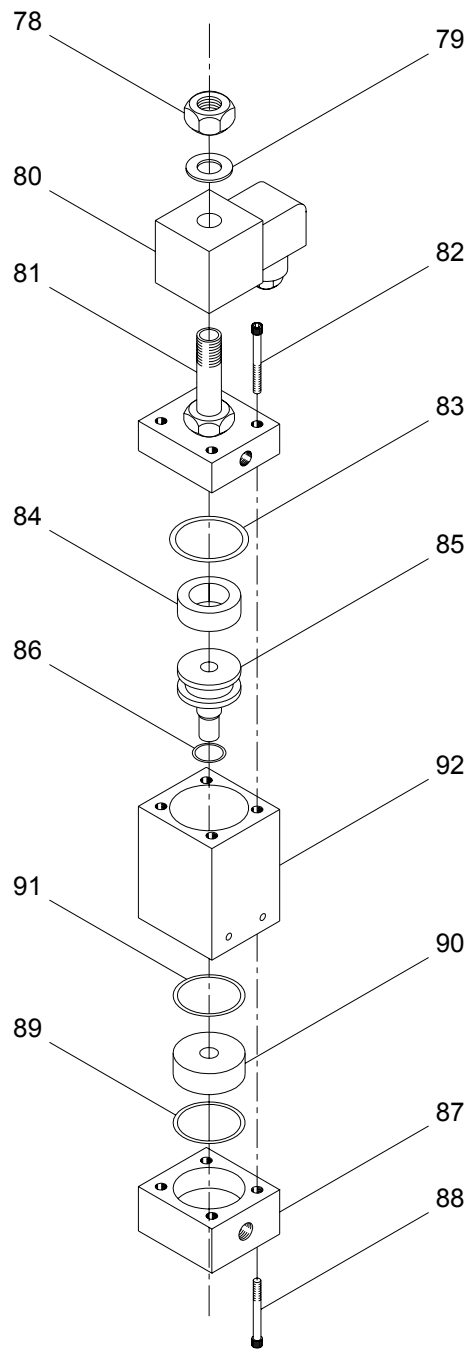
**Figure 7-3. HPBAC Instrument and Control Panel (Sheet 2)**



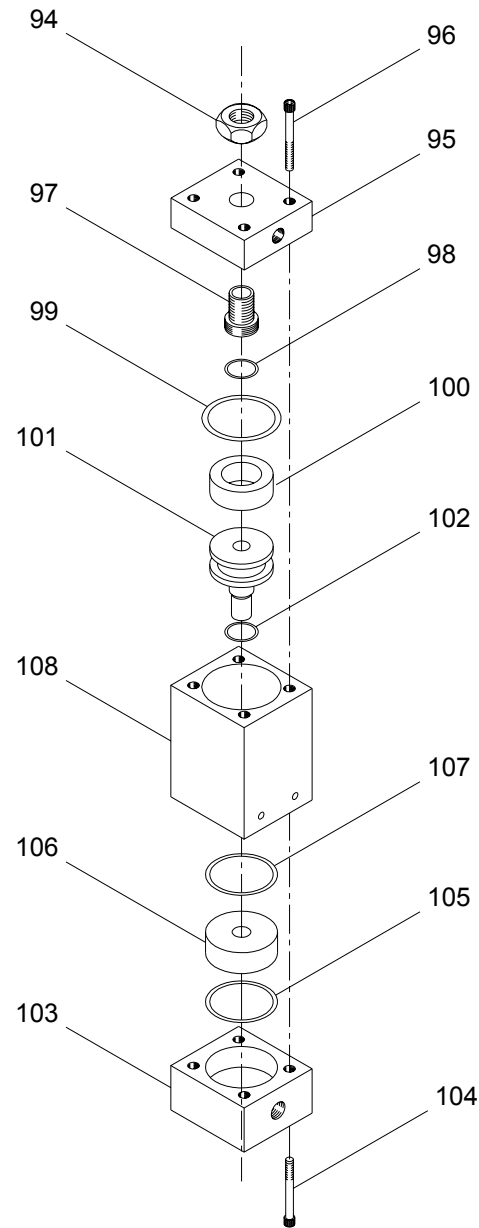
**Figure 7-3. HPBAC Instrument and Control Panel (Sheet 3)**



**Figure 7-3. HPBAC Instrument and Control Panel (Sheet 4)**



CONDENSATE DRAIN VALVE, 2ND STAGE



CONDENSATE DRAIN VALVE, 3RD & 4TH STAGES

**Figure 7-3. HPBAC Instrument and Control Panel (Sheet 5)**



**Table 7-3. HPBAC Instrument and Control Panel Parts List**

FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
7-3	Instrument and Control Panel	REF		K845292-2
1	Not Used			
2	Not Used			
3	Not Used			
4	Not Used			
5	Tube Assembly, 4th Stage Air Pressure Gauge, 1/8" OD	1		K845293-4
6	Tube Assembly, 3rd Stage Air Pressure Gauge, 1/8" OD	1		K845293-3
7	Tube Assembly, 2nd Stage Air Pressure Gauge, 1/8" OD	1		K845293-2
8	Tube Assembly, 1st Stage Air Pressure Gauge, 1/8" OD	1		K845293-1
9	Tube Assembly, Oil Pressure Gauge to T Fitting, 6 mm OD	1		K845294-2
10	Connector, Female	4	57328	CON0019
11	Connector, Female	1	57328	CON0021
12	Gauge, 4th Stage Air Pressure	1	57328	GAG0009S
13	Gauge, 3rd Stage Air Pressure	1	57328	GAG0008S
14	Gauge, 2nd Stage Air Pressure	1	57328	GAG0007S
15	Gauge, 1st Stage Air Pressure	1	57328	GAG0006S
16	Gauge, Oil Pressure	1	57328	GAG0008S
17	Switch, Pushbutton	1		400-220-025
18	Plate, Legend	1		400-220-036
19	Switch, On/Off Selector, Illuminated	1	57328	SWT0017
20	Label, Power On/Off	1		K300324-1
21	Indicator, Maintenance, Intake Filter	1	57328	K600135-2
22	Indicator Light, Red	2	57328	LIT0040
23	Hourmeter	1	57328	HMR0021
24	Switch, Master On/Off Selector	1		400-220-028
25	Label, Master On/Off Switch Warning	1	58163	K300431-1
26	Plate, On/Off, Master Selector Switch	1		400-220-037
27	Not Used			
28	Tube Assembly, ACD, Solenoid Vent, 6mm OD	1		K845297-1
29	Tube Assembly, Pressure Regulator to T Fitting, 6mm OD	1		K845294-1
30	. Fitting, T	1		400-082-140

**Table 7-3. HPBAC Instrument and Control Panel Parts List - Continued.**

FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
31	Clamp, Tube	6		CMP0087
	Attaching Parts			
32	Screw, Hex Head, 1/4-20 x 3/4"	1	57328	SCR0011
33	Nut, Lock, 1/4"	1	57328	NUT0005
34	Washer, Lock, 1/4"	1	57328	WAS0033
35	Washer, Flat, 1/4"	2	57328	WAS0063
	---*---			
36	Tube Assembly, Oil Pressure Switch, 6mm OD	1		K845296-1
37	Tube Assembly, Air Pressure Switch, 6mm OD	1		K845296-2
38	Tube Assembly, ACD Pilot Pressure, 6mm OD	1		K845297-2
39	Tube Assembly, 2nd Stage Interstage, Separator Drain, 8mm OD	1		K845298-2
40	Tube Assembly, Compressor Air Outlet, 8mm OD	1		K845298-1
41	Tube Assembly, Final Oil/Water Separator Drain to ACD, 8mm OD	1		K845295-2
42	Tube Assembly, 3rd Stage Separator Drain to ACD, 8mm OD	1		K845298-3
43	Label, ACD Valve	1		K300282
44	ACD Assembly	1		K600129-3
	Attaching Parts			
45	Capscrew, Hex Head	2	57328	SCR0025
46	Nut, Hex	2	57328	NUT0062
47	Washer, Lock, 1/4"	2	57328	WAS0001
48	Washer, Flat	2	57328	WAS0021
	---*---			
49	Manifold, Condensate Drain	1		061216
50	Capscrew, Socket Head	6	57328	SCR0177
51	Washer, Flat	6	57328	WAS0024
52	O-ring	3	57328	N04333
53	Elbow, Male	1	57328	ELL0060
54	Nut, 6mm S	1		K600129-22
55	Bite Ring, 6mm S	1		K600129-23
56	Nut, 6mm L	1		K600129-40
57	Bite Ring, 6mm L	1		K600129-41
58	Nut, 6mm L	1		K600129-38
59	Bite Ring, 6mm L	1		K600129-39

**Table 7-3. HPBAC Instrument and Control Panel Parts List - Continued.**

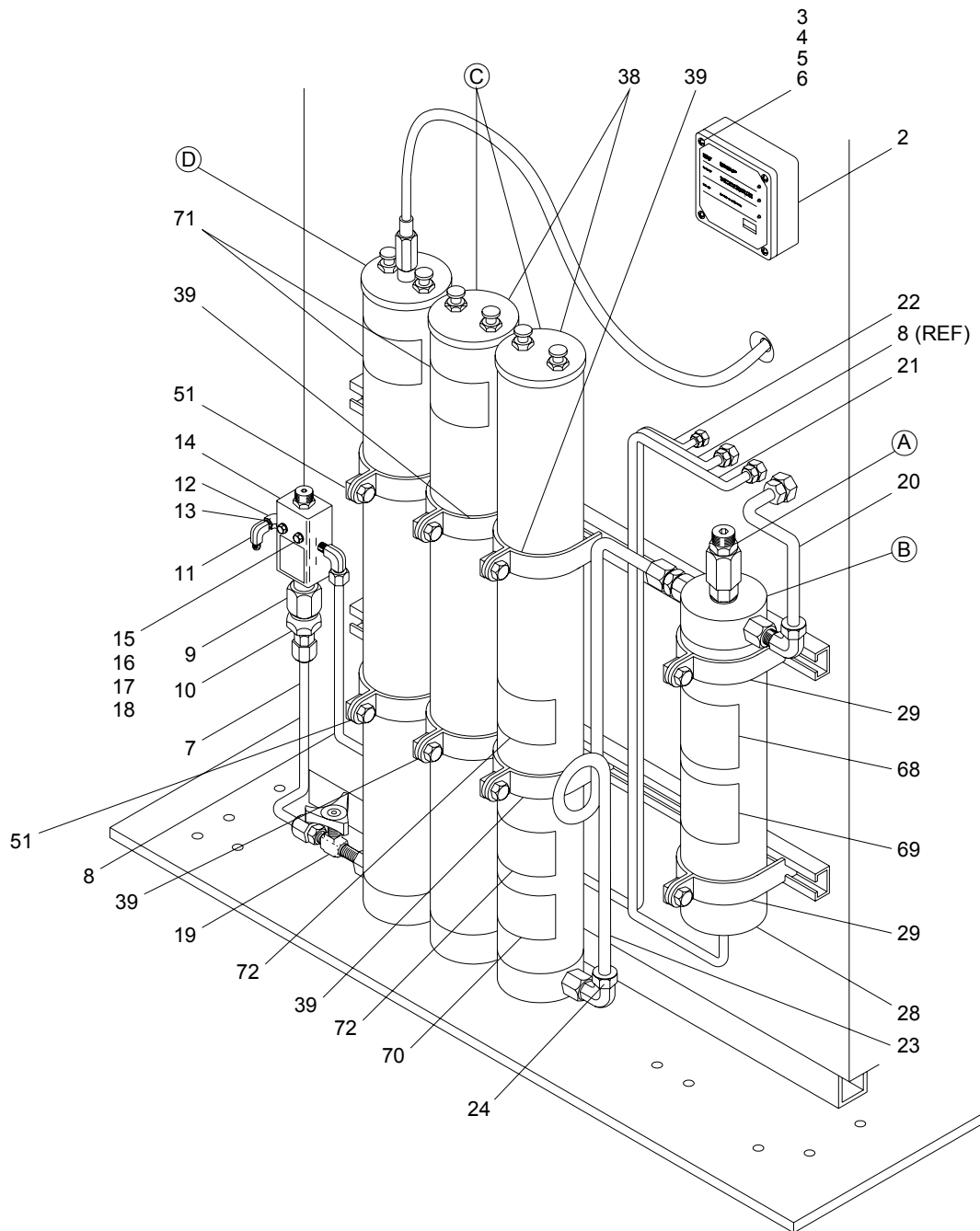
FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
60	Nut, 8mm L	1		K600129-34
61	Bite Ring, 8mm L	1		K600129-35
62	Nut, 8mm L	1		K600129-36
63	Bite Ring, 8mm L	1		K600129-37
64	Nut, 6mm S	1		K600129-22
65	Bite Ring, 6mm S	1		K600129-27
66	Tube, Round (Specify length on order)	2	57328	TUBR0010
67	Connector, Male	5	57328	CON0143
68	Drain Valve, Manual Complete	3	57328	011430
69	Tap, Drain Valve	3	57328	055888
70	Seat, Drain Valve	3	57328	013283
71	Body, Manual Drain Valve	3	57328	068410
72	Connector, Male	2	57328	CON0041
73	Gasket, Copper	2	57328	N01316
74	Fitting, Orifice	1	57328	070615
75	Pipe Plug, Hex	1	57328	PLU0028
76	Gasket, Copper	1	57328	N04051
77	Valve, Condensate Drain, 2nd Stage 115 Vac, 50/60 Hz	1	57328	060410
78	Nut, Hex (Comes with Item 81)	1	57328	No number
79	Washer, Lock (Comes with Item 81)	1	57328	No number
80	Coil, High Temp	1	57328	N04182
81	Valve, Solenoid (Includes Items 78 and 79)	1	57328	058053
	Attaching Parts			
82	Capscrew, Socket Head	4	57328	SCR0145
	---*---			
83	O-ring	1	57328	N02720
84	Ring, Sealing	1	57328	N04177
85	Piston, Valve	1	57328	057628
86	O-ring	1	57328	N03489
87	Flange, Base	1	57328	060416
	Attaching Parts			
88	Capscrew, Socket Head	1	57328	SCR0132
	---*---			
89	O-ring	1	57328	N02507

**Table 7-3. HPBAC Instrument and Control Panel Parts List - Continued.**

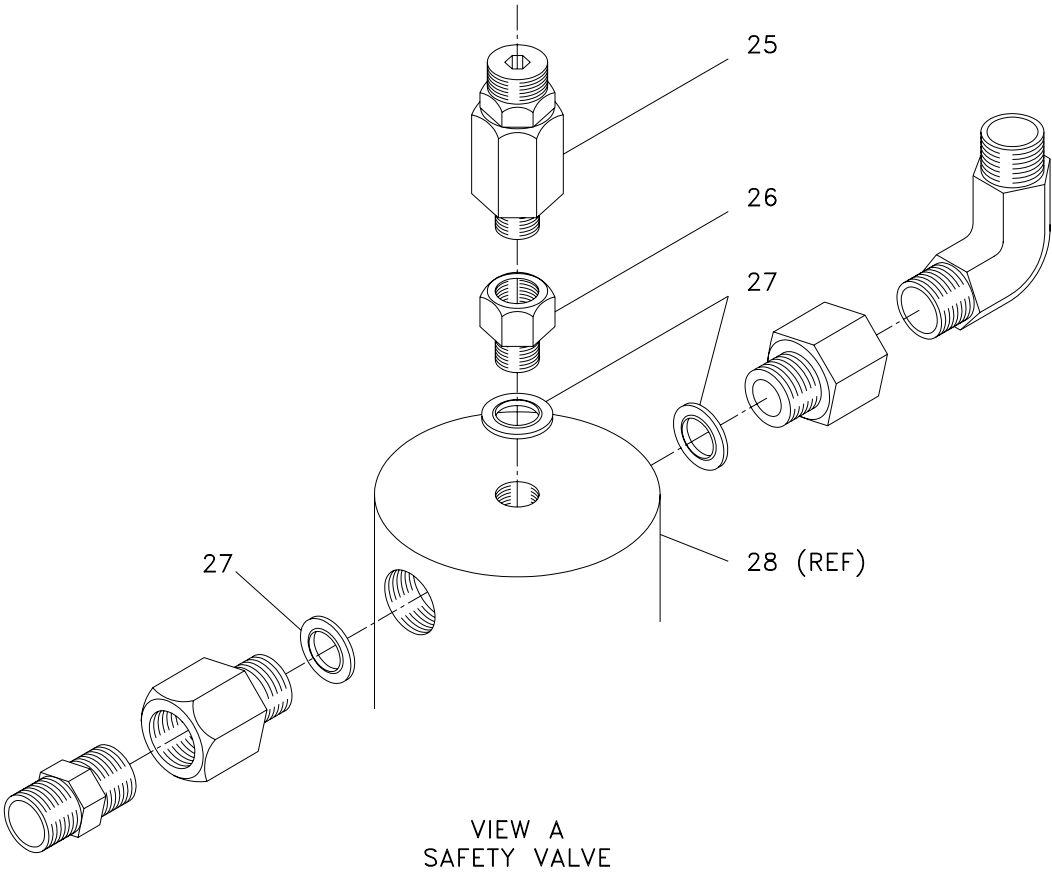
FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
90	Seat, Valve	1	57328	056687
91	O-ring	1	57328	N04178
92	Body, Valve (not procurable; purchase NHA)	1	57328	060414
93	Valve, Condensate Drain, 3rd and 4th Stages	2	57328	061010
94	Nut, Hex	1	57328	N03764
95	Flange, Top	1	57328	061007
	Attaching Parts			
96	Capscrew, Socket Head	4	57328	SCR0176
	---*---			
97	Screw, Adjusting	1	57328	057353
98	O-ring	1	57328	N07091
99	O-ring	1	57328	N02720
100	Ring, Sealing	1	57328	N04177
101	Piston, Valve	1	57328	057629
102	O-ring	1	57328	N03489
103	Flange, Base	1	57328	060416
	Attaching Parts			
104	Capscrew, Socket Head	4	57328	SCR0132
	---*---			
105	O-ring	1	57328	N02507
106	Seat, Valve	1	57328	056691
107	O-ring	1	57328	N04178
108	Body, Valve (not procurable; purchase NHA)	1	57328	060414
	Separation/Collection System	1	57328	
109	Clamp, Hose, Worm Gear	2	57328	CMP0007
110	Tube, Flexible	2	57328	TUBR0038
111	Fitting, Hose, Barb	2	57328	FTG0050
112	Silencer/Separator, with Bracket	1	57328	SEP0016
113	Elbow, Female Pipe	1	57328	ELL0114
114	Nipple, Pipe	1	57328	NIP0135
115	Elbow, Street	1	57328	ELL0115
116	Clamp, Hose Fitting 3/8" – 7/8"	2	57328	CMP0003
117	Hose, Oil (Specify length on order)	1	57328	HOSR0034
118	Fitting, Hose, Barb	1	57328	FTG0092
119	Elbow, Street	1	57328	ELL0110

**Table 7-3. HPBAC Instrument and Control Panel Parts List - Continued.**

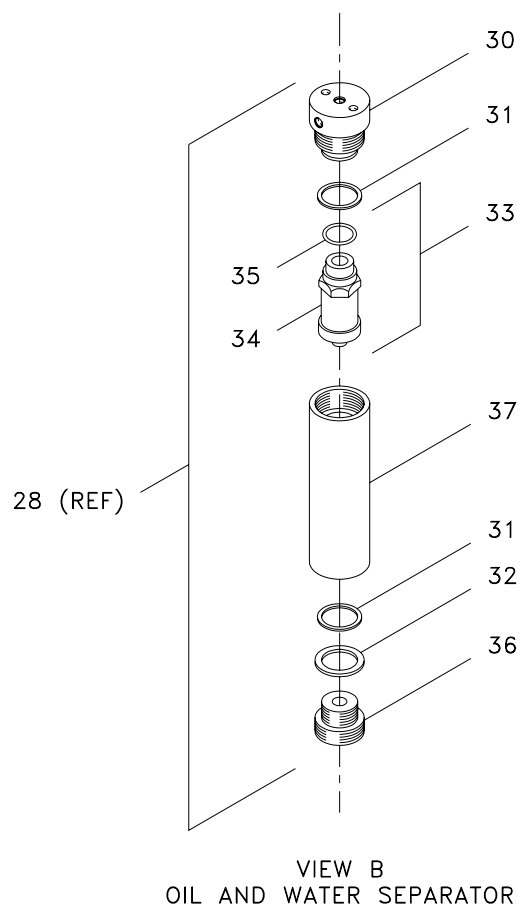
FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
120	Fitting, Hose, Barb	1	57328	FTG0038
121	Pre-Separator Assembly	1	57328	TNK0068
122	Unistrut Clamp, 3-1/2" Tube 3" Pipe	1	57328	CMP0015
123	Clamp, Hose Fitting 3/8" – 7/8"	1	57328	CMP0003
124	Nut, Push, 5/16" Diameter	3	57328	NUT0046
125	Washer, Flat	2	57328	WAS0073
126	Cap	1	57328	CAP0047
127	Nut, Push, 5/16" Diameter	3	57328	NUT0046
128	Tube, ACD Cap, 8 mm OD x 2"	3	57328	TUB0294
129	Not Used			
130	Not Used			
131	Not Used			
132	Not Used			
133	Not Used			
134	Bracket, Angle, ACD	1	57328	
135	Screw, Hex head, 1/4-20 x 3/4"	2	57328	SCR0011
136	Nut, Lock, 1/4"	2	57328	NUT0005
137	Washer, Lock, 1/4"	2	57328	WAS0033
138	Washer, Flat, 1/4"	2	57328	WAS0063
	---*---			
139	Mount, Purification	2	57328	MTS0132
	Attaching Parts			
140	Screw, Hex head, 1/4-20 x 3/4"	4	57328	SCR0011
141	Nut, Lock, 1/4"	4	57328	NUT0005
142	Washer, Lock, 1/4"	4	57328	WAS0033
143	Washer, Flat, 1/4"	4	57328	WAS0063
144	Fitting, Tube, 1/8" OD			400-082-141
145	Fitting, Tube, 1/8" OD	2		400-082-142
146	Fitting, Tube, 8 mm OD	1		400-082-143
147	Not Used			
148	Label, Bleed Valve	1		K300313
149	Grommet	1		400-102-011
150	Harness, Wire	1		400-1073-150
151	Panel, Front	1	57328	PNL0271
152	Label, Identification	1		K300379-02



**Figure 7-4. Air Purification System (Sheet 1 of 5)**

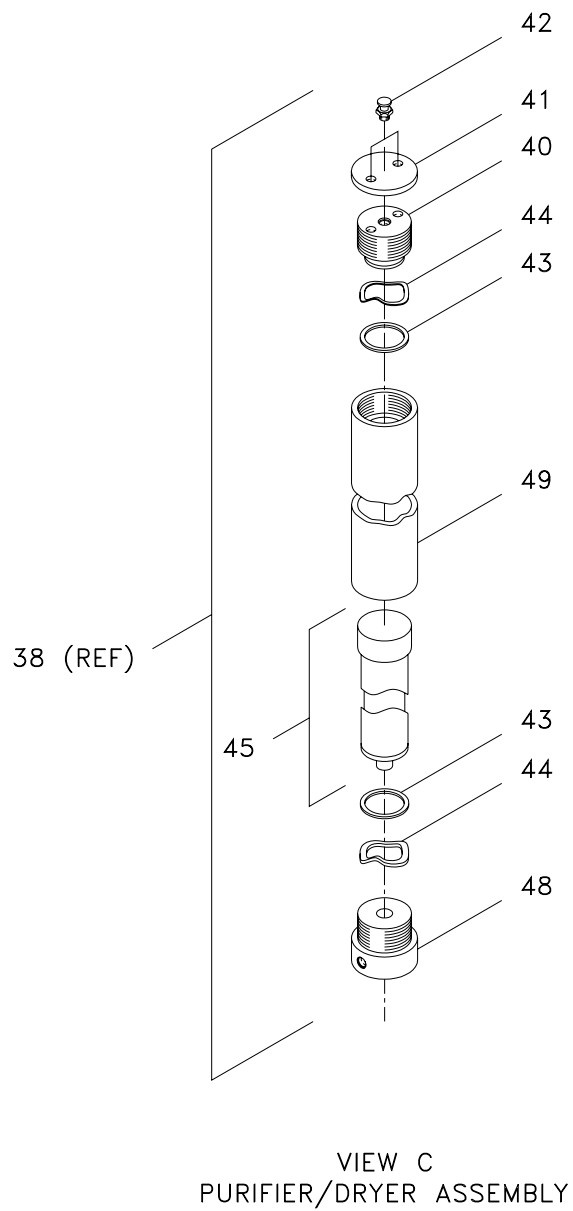


**Figure 7-4. Air Purification System (Sheet 2)**



**Figure 7-4. Air Purification System (Sheet 3)**





**Figure 7-4. Air Purification System (Sheet 4)**

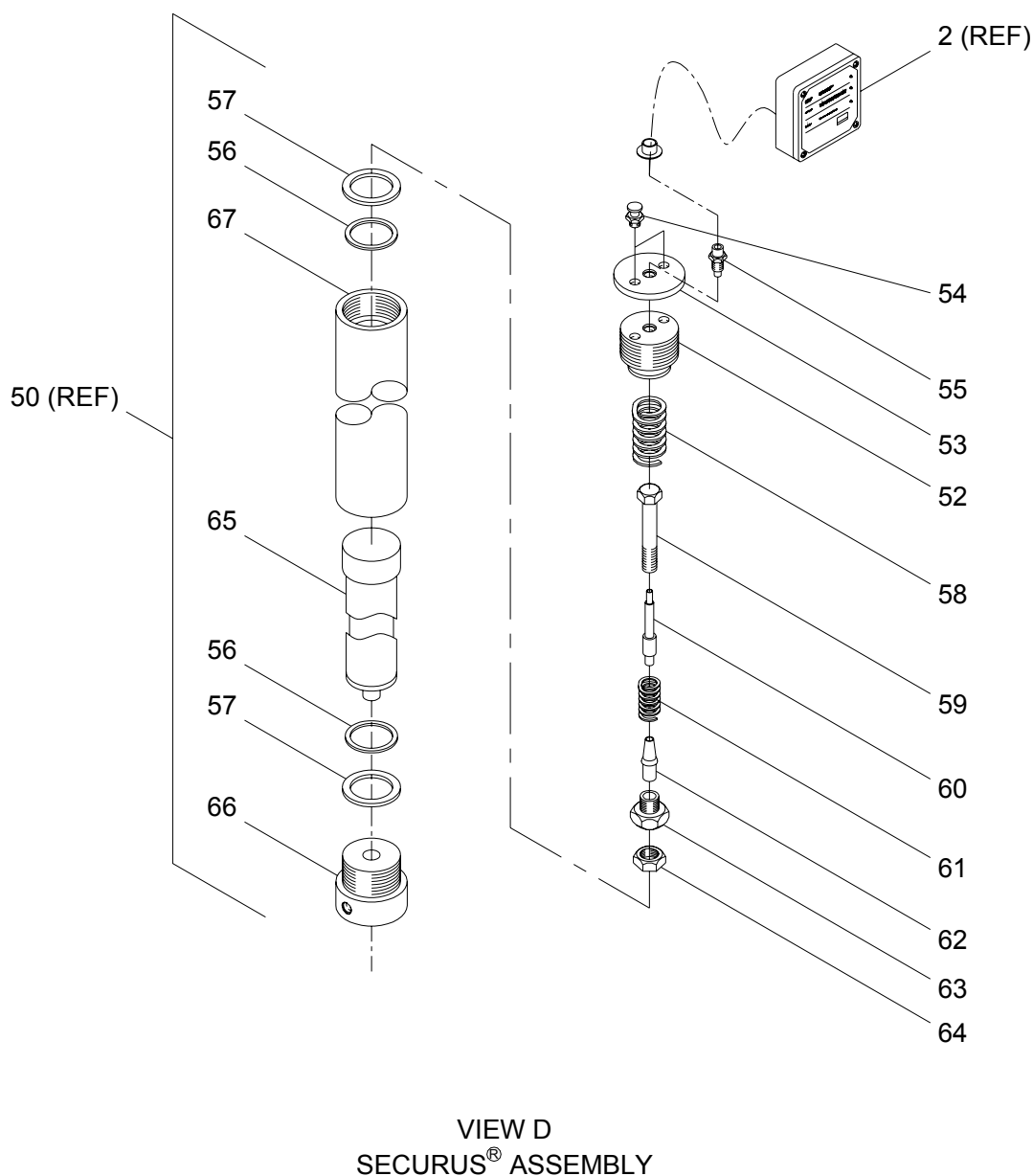


Figure 7-4. Air Purification System (Sheet 5)

**Table 7-4. Air Purification System Parts List**

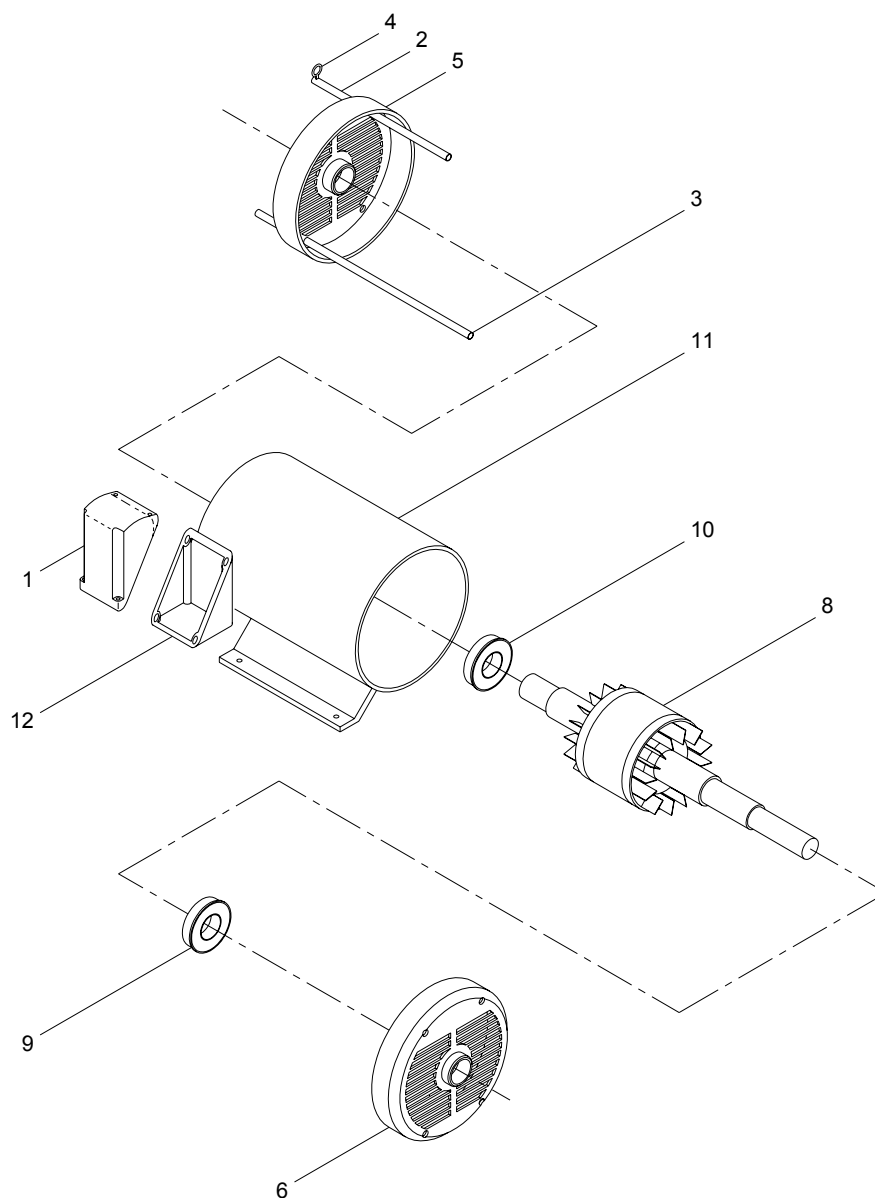
FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
7-4	Air Purification System (See Figure 7-1, Item 112)	REF		K600133
1	Probe and Cable, Securus® Indicator (Part of 2)	1		No number
2	Monitor, Purification, Securus®	1		K600129-7
	Attaching Parts			
3	Screw, Slotted Head, #8-32 x 3/8"	4		400-211-108
4	Nut, Lock, #8-32	4		400-160-033
5	Washer, Lock, #8	4		400-270-063
6	Washer, Flat, #8	4		400-270-065
	---*---			
7	Tube Assembly, Bleed Valve to 2nd Check Valve, 8mm OD	1		K845298-5
8	Tube Assembly, Air Pressure, Pressure Maintaining Valve to Air Pressure Switch, 6mm OD	1		K845296-3
9	Not Used			
10	Valve, Check	1	57328	VAL-0007
11	Fitting, 1/4 F NPT Swivel	1		400-082-141
12	Fitting, Adapter, 1/4 NPT F x 8mm	1		400-082-142
13	Fitting, Elbow 90° 1/4 NPT M x 1/4 NPT F	1		400-082-143
14	Valve, Pressure Maintaining	1	57328	VAL-0053
	Attaching Parts			
15	Screw, Hex Head, 1/4-20 x 1-5/8"	2		400-211-109
16	Nut, Lock, 1/4"	2	57328	NUT0005
17	Washer, Lock, 1/4"	2	57328	WAS0033
18	Washer, Flat, 1/4"	2	57328	WAS0063
	---*---			
19	Valve, Bleed	1	57328	065126
20	Tube Assembly, Inlet to Final Oil/Water Separator, 8mm OD	1		K845298-4
21	Tube Assembly, Final Oil/Water Separator Drain, 6mm OD	1		K845295-1
22	Tube Assembly, 4th Stage Gauge, 1/8" OD	1		K845293-5
23	Tube Assembly, Final Oil/Water Separator to Check Valve, 10mm OD	1		K845299-1
24	Valve, Check	1		K600129-26
25	Valve, Relief	1	57328	VAL-0169
26	Adapter	3	57328	ADP0020

**Table 7-4. Air Purification System Parts List - Continued.**

FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
27	Gasket, Fitting	3	57328	N04499
28	Separator, Coalescing (Units S/N 1596-1599 and 11785-11787 built with special separator 090050. Consult compressor manufacturer.)	1	57328	079416
	Attaching Parts			
29	Clamp, Unistrut	2	57328	CMP0004
	---*---			
30	Head, Separator (not procurable; purchase NHA)	1	57328	No number
31	O-ring	2	57328	N04586
32	Not used	2	57328	N04736
33	Element, Coalescing Filter (see 34)	1		K600129-47
34	Element, Micro-Filter (includes Item 35)	1	57328	061860
35	O-ring	1	57328	N15133
36	Plug, Button (not procurable)	1	57328	No number
37	Housing, Separator (not procurable)	1	57328	No number
38	Chamber Assembly, Purifier	2	57328	058814
	Attaching Parts			
39	Clamp, Unistrut	2	57328	CMP0004
	---*---			
	Head Assembly, Filter	1	57328	061231
40	Head, Filter (not procurable; purchase NHA)	1	57328	No number
41	Plate, Cover	1	57328	061237
42	Screw, Tool Post	2	57328	012293
43	O-ring	2	57328	N04735
44	Ring, Back-up	2	57328	N04736
45	Cartridge, Dryer	2	57328	058825A
46	Not used			
47	Not used			
48	Plug, Bottom (not procurable; purchase NHA)	1	57328	No number
49	Housing, Filter (not procurable; purchase NHA)	1	57328	No number
50	Chamber Assembly	1	57328	060082
	Attaching Parts			
51	Clamp, Unistrut	2	57328	CMP0004
	---*---			

**Table 7-4. Air Purification System Parts List - Continued.**

<b>FIGURE/ INDEX NO.</b>	<b>DESCRIPTION</b>	<b>QTY</b>	<b>CAGE CODE</b>	<b>PART NO./ IDENTIFYING NO.</b>
52	Head, Filter (not procurable; purchase NHA)	1	57328	No number
53	Plate, Cover	1	57328	060135
54	Screw, Tool Post	2	57328	012293
55	Socket	1	57328	059850
56	O-ring	2	57328	N04735
57	Ring, Back-up	2	57328	N04736
58	Spring, Compression	1	57328	002181
59	Bolt	1	57328	059851
60	Pin, Fixed	1	57328	059853
61	Spring, Compression	1	57328	059862
62	Pin, Loose	1	57328	059854
63	Screw, Drawback	1	57328	059852
64	Nut	1	57328	059855
65	Cartridge, Purifier	1	57328	060037-A
66	Plug, Bottom (not procurable; purchase NHA)	1	57328	No number
67	Housing, Filter (not procurable; purchase NHA)	1		No number
68	Label, Caution, Oil and Water Separator	1		400-300-006
69	Label, Final Separator Maintenance	1		400-300-007
70	Label, Warning, Important Notice	1		400-300-004
71	Label, Cartridge Instal., Drying	1		400-300-003
72	Label, Cartridge Instal.	1		400-300-002
73	Label, Carbon Monoxide Rem, Cartridge	1		400-300-001



**Figure 7-5. Drive Motor/Cable Assembly**

**Table 7-5. Drive Motor/Cable Assembly Parts List**

FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
7-5	Drive Motor/Cable Assembly	REF		K845337
	Cable Assembly	1		K600133-13
	Motor Assembly (REF Figure 7-1, Item 143)	1		K600133-10
1	Lid, Conduit Box	1	05472	K600133-10-1
2	Through Bolts Used with Lifting Lugs	2	05472	K600133-10-2
3	Through Bolts	2	05472	K600133-10-3
4	Lug, Lifting	2	05472	K600133-10-4
5	Endplate, Front	1	05472	K600133-10-5
6	Endplate, Pulley End	1	05472	K600133-10-6
7	Not used			
8	Rotor and Shaft Assembly	1	05472	K600133-10-8
9	Bearing, Pulley End	1	05472	K600133-10-9
10	Bearing, Front End	1	05472	K600133-10-10
11	Wound Stator Assembly	1	05472	K600133-10-11
12	Box, Conduit	1	05472	K600133-10-12

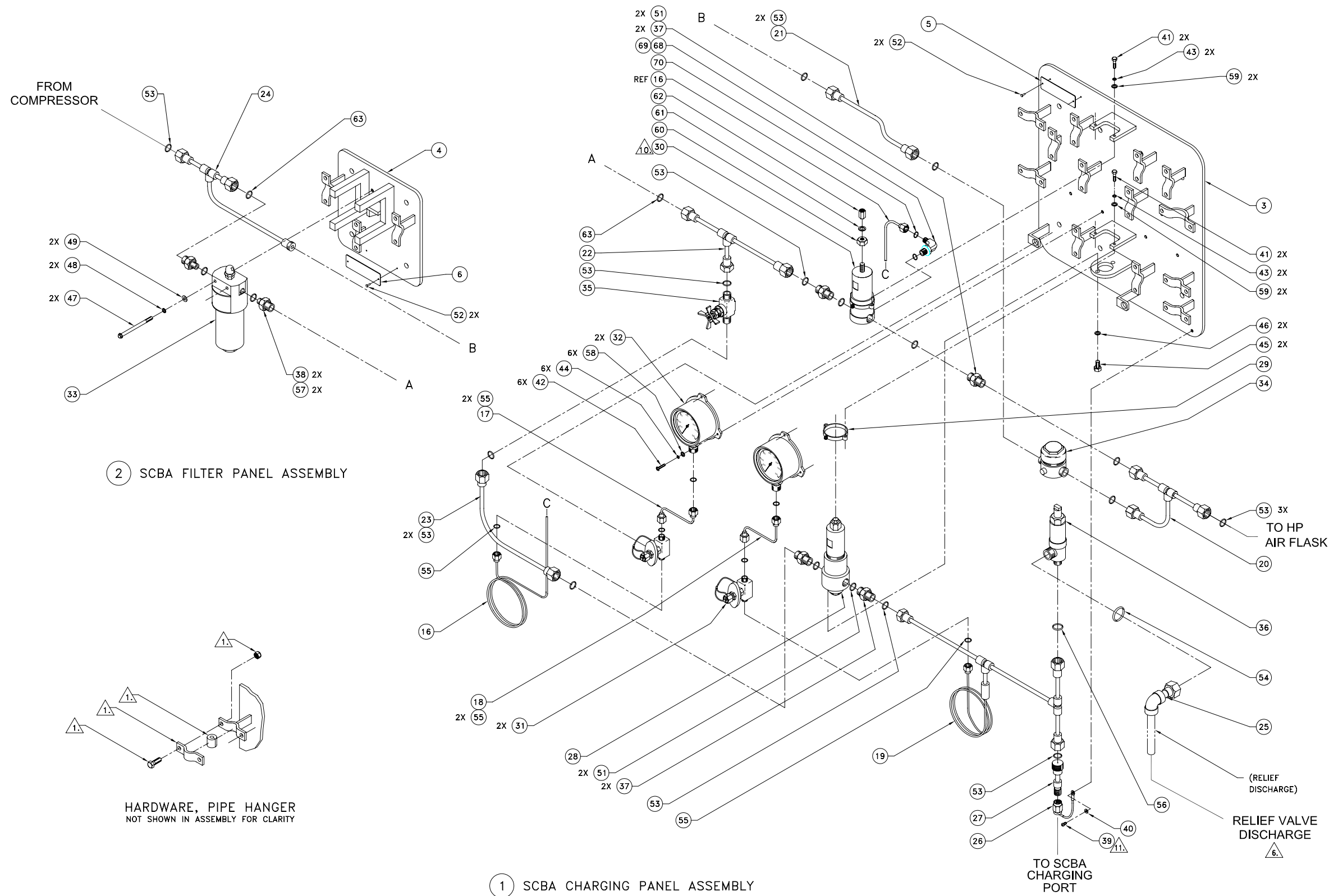


Figure 7-6. SCBA Filter Panel and Charging Panel Assemblies



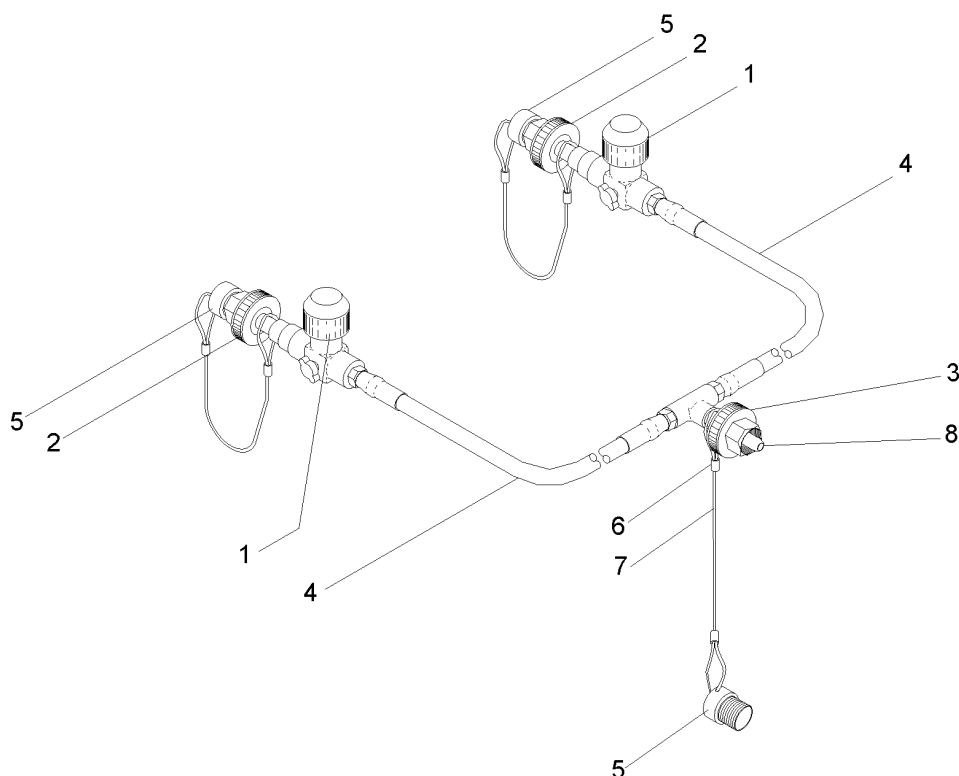
THIS PAGE INTENTIONALLY LEFT BLANK

**Table 7-6. SCBA Filter Panel and Charging Panel Assemblies Parts List**

FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
7-6/1	SCBA Charging Panel Assembly	REF	53711	7246025-1
2	SCBA Filter Panel Assembly	REF	53711	7246025-2
3	SCBA Charging Panel Weldment	1	53711	7246026-1
4	SCBA Filter Panel Weldment	1	53711	7246026-2
5	Label, SCBA Charging Panel Assembly	1	53711	7246028-1
6	Label, SCBA Filter Panel Assembly	1	53711	7246028-2
7	Label, Regulator (Not shown)	1	53711	7246028-3
8	Label, Check Valve (Not shown)	1	53711	7246028-4
9	Label, Stop Valve (Not shown)	1	53711	7246028-5
10	Label, Instrument Valve (Not shown)	1	53711	7246028-6
11	Label, Back Pressure Regulator (Not shown)	1	53711	7246028-7
12	Label, Relief Valve (Not shown)	1	53711	7246028-8
13	Label, Instrument Valve (Not shown)	1	53711	7246028-9
14	Label, Gauge (Not shown)	1	53711	7246028-10
15	Label, Gauge (Not shown)	1	53711	7246028-11
16	CGA 347 Cap Assy	1	53711	7246035-1
17	CGA 347 Cap Assy	1	53711	7246035-2
18	CGA 347 Cap Assy	1	53711	7246035-3
19	CGA 347 Cap Assy	1	53711	7246035-4
20	CGA 347 Cap Assy	1	53711	7246035-5
21	CGA 347 Cap Assy	1	53711	7246035-6
22	CGA 347 Cap Assy	1	53711	7246035-7
23	CGA 347 Cap Assy	1	53711	7246035-8
24	CGA 347 Cap Assy	1	53711	7246035-9
25	CGA 347 Cap Assy	1	53711	7246035-10
26	CGA 347 Cap Assy	1	53711	7245943-1
27	Adapter	1	53711	6887834
28	Regulator	1	33538	44F1369-1061-227
29	Bracket Assembly, Panel Mounting	1	33538	1129
30	Regulator, Back Pressure	1	33538	26F1762-36-497
31	Valve, Instrument	2	54716	6GN382-1
32	Gauge, 0-8000 psi	2	3E734	EA24-3PXP-LWBX
33	Filter	1	59165	4545GG-05DN-V
34	Valve, Check	1	99565	680-1-0X PL4572G
35	Valve, Stop	1	99565	380-1-0X PL3535G

**Table 7-6. SCBA Filter Panel and Charging Panel Assemblies Parts List - Continued.**

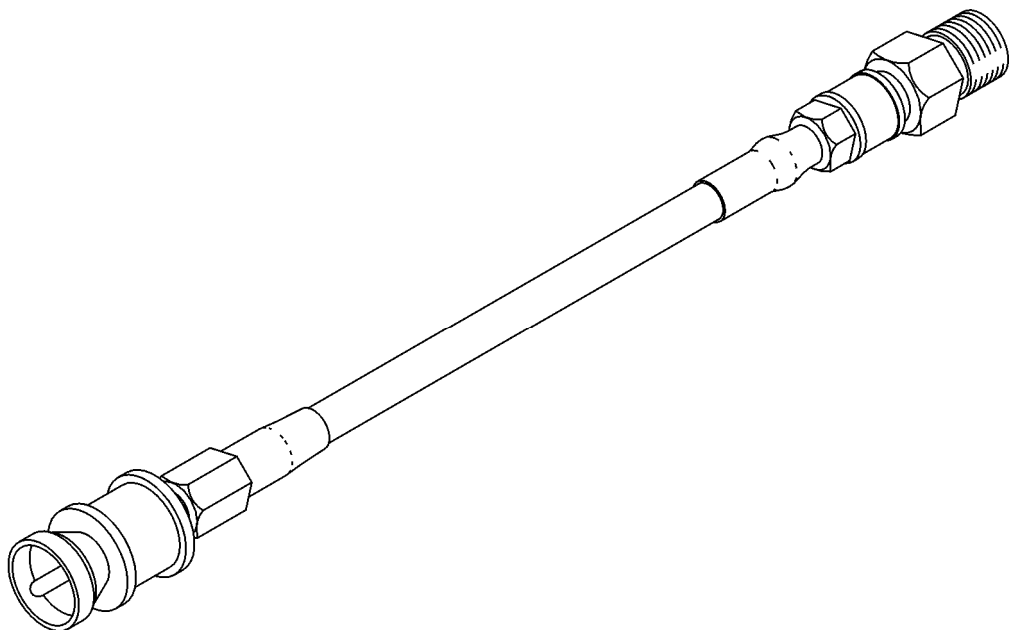
FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
36	Valve, Relief	1	99565	158-3 PL5054
37	Thread Piece	4	99565	59T-1-SS
38	Thread Piece	2	99565	59T-2-SS
39	Screw, Machine-Pan Head, Cross-Recessed	1	96906	MS51957-62
40	Washer, Flat, Reduced OD	1	80205	NAS620C10
41	Screw, Cap, Hex Head	4	80205	M35307-308
42	Screw, Machine-Pan Head, Cross-Recessed	6	96906	MS51957-130
43	Washer, Lock-Spring	4	80205	M35338-139
44	Washer, Lock-Spring	6	80205	M35339-138
45	Screw, Cap, Hex Head	2	80205	M35308-358
46	Washer, Lock-Spring	2	80205	M35338-141
47	Screw, Cap, Hex Head, Grade 8, Zinc Plated	2		B1821BH031C500N
48	Washer, Lock-Spring	2	80205	M35338-140
49	Washer, Flat	2	80205	M15795-812
50	Not Used			
51	O-ring	4	81343	M83248/2-906 CP
52	Rivet, Blind	4	39428	97447A135
53	O-ring	12	81343	M83248/2-114 CP
54	O-ring	1	81343	M83248/2-217 CP
55	O-ring	6	81343	M83248/2-008 CP
56	O-ring	1	81343	M83248/2-212 CP
57	O-ring	2	81343	M83248/2-908 CP
58	Washer, Flat	6	80205	MS15795-808
59	Washer, Flat	4	80205	MS15795-852
60	Nut, Load	1	33538	2151-2
61	Washer	1	33538	2155-4
62	Nut	1	33538	2152-2
63	O-ring	2	81343	M83248/2-210 CP
64	Not Used			
65	Nut, Locking	32		
66	Screw, Hex Head	30		MS90725-62
67	Screw, Hex Head	2		MS90725-64
68	Elbow, Positionable	1	11649	SS-4-VCO-9P-4ST
69	O-ring	2	81343	M83248/2-904
70	O-ring	2	81343	M83248/2-010 CP



**Figure 7-7. Filtered Air Supply Hose Assembly (H-103)**

**Table 7-7. Filtered Air Supply Hose Assembly (H-103) Parts List**

FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
7-7	Filtered Air Supply Hose Assembly (H-103)	1	53711	53711ASSY724 5948-1
1	Valve, In-line	2	62882	LV3-4ST-KF
2	Weldment, Adapter	2	53711	53711-7245948-1
3	Weldment, Tee	1	53711	53711-7245948-2
4	Hose	2	11704	SS-8R-4-ST4-S T4-120
5	Plug, CGA	3	53711	53711-7245943-2
6	Sleeve, Swaging	6	96906	MS51844-62
7	Rope, Wire, 10.0 long	3	81349	M83420/4-002
8	O-ring	3	81349	M83248/2-010
NS	O-ring	6	81349	M83248/2-904



**Figure 7-8. Scott® Charging Wand**

**Table 7-8. Scott® Charging Wand Parts List**

FIGURE/ INDEX NO.	DESCRIPTION	QTY	CAGE CODE	PART NO./ IDENTIFYING NO.
7-8	Scott® Charging Wand	1	15927	200150-03

## CHAPTER 8

### INSTALLATION

#### 8.1 INTRODUCTION.

This chapter presents information on the installation requirements and procedures necessary to ensure safe and effective operation of the Self-Contained Breathing Apparatus High Pressure Breathing Air Charging System (SCBA HP BACS) for LPD-4 Class Ships. Ensure that lifting devices used to move the unit are adequate to handle the system weight of approximately 1468 pounds plus a recommended minimum safety factor of 33%, and that the floor or site will sustain that weight. Position the unit so that it is level; permissible inclination in any direction from the horizontal plane is 10 degrees. The High Pressure Breathing Air Compressor (HPBAC) frame is supported by four cable mount plates, each holding two coil isolators secured to the base plate with 64 1/4-28 x 1.25 screws. The cable mount plates may be secured to a sub-base with eight 5/8-inch bolts. See Figure 8-2 for a footprint and for hole locations in the vibration isolating cable mount plates.

#### 8.2 INSTALLATION DRAWINGS.

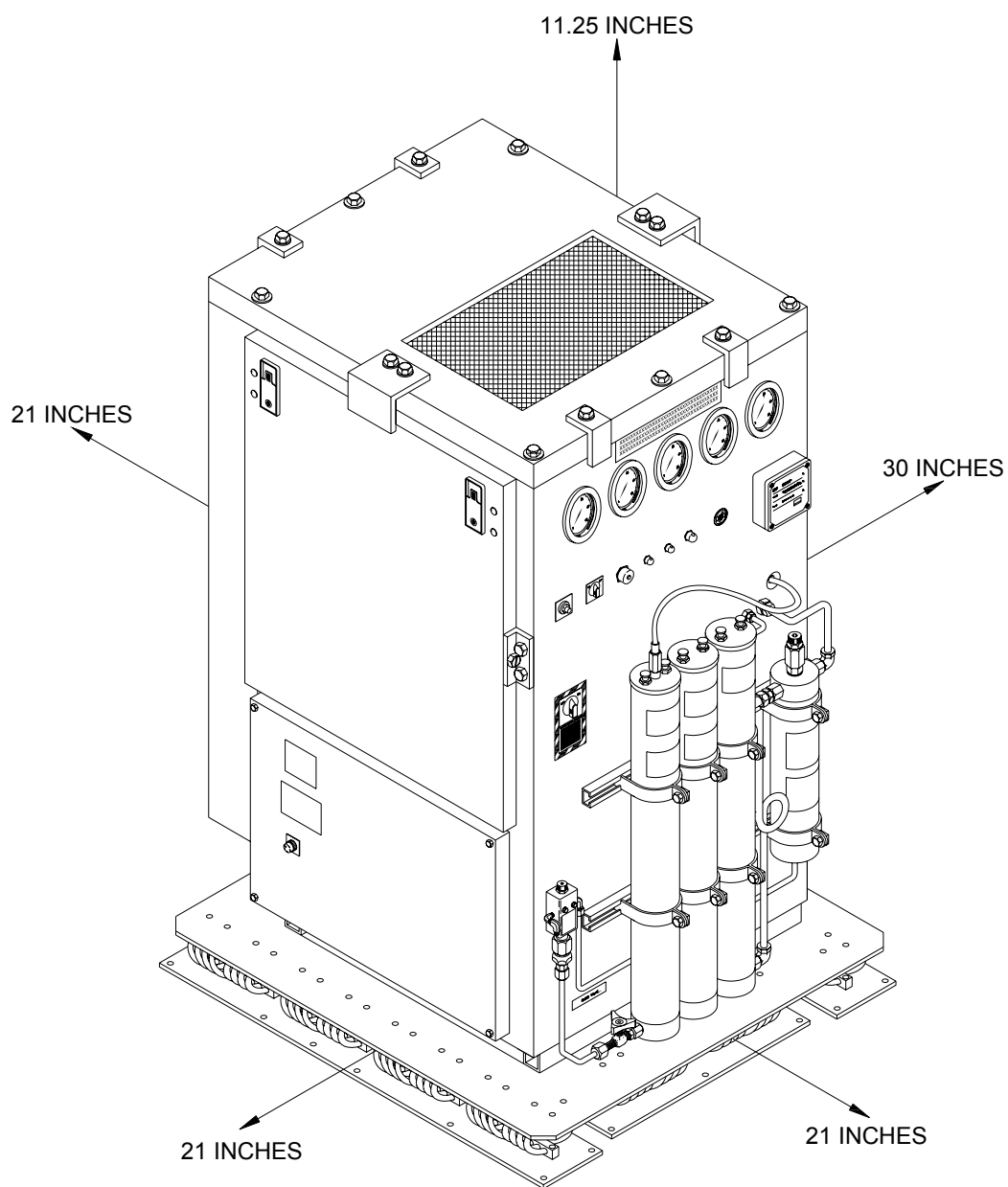
The three illustrations shown below outline the installation requirements for the SCBA HP BACS; key dimensions are included where necessary:

- Figure 8-1, Minimum Clearances
- Figure 8-2, Footprint, Cable Mount Base Plate
- Figure 8-3, Ship's Power Input and Center of Gravity

#### 8.3 CLEARANCES.

The dimensions shown below are critical to airflow. See Figure 8-1 and the following guidelines for clearance requirements:

- **Top:** A minimum of 11.25 inches above the top of the HPBAC is required to service the purification chambers.
- **Left Side:** A minimum of 21 inches is required for maintenance access.
- **Right Side:** A minimum of 30 inches is necessary to service the dryer/purification chambers and to fill air storage cylinders.
- **Front:** A minimum of 21 inches is necessary for operation and maintenance.
- **Rear:** For operational maintenance, replacement of motor or drive V-belts requires approximately 21 inches of clearance.



**Figure 8-1. Minimum Clearances**

## **8.4 UNPACKING AND PRESERVATION.**

Each unit is delivered, unpacked, and installed by the manufacturer. Figure 8-2 outlines the footprint of the system. Ensure that lifting devices used to move the unit are adequate to handle the system weight of approximately 1468 pounds plus a recommended minimum safety factor of 33% (approximately 1953 pounds), and that the site's foundations will sustain that weight. Position the unit so that it is level; permissible inclination in any direction from the horizontal is 10 degrees. The HPBAC frame is supported by four cable mount plates, each holding two coil isolators secured to the base plate with 64 1/4-28 x 1.25 screws. See Figure 8-2 for footprint and hole locations in the vibration isolating cable mount base plate.

**8.4.1 UNPACKING.** There are no special tools required to unpack or install the HPBAC, but care should be taken when unpacking the unit to be aware of its configuration and to avoid damaging any of the components caused by careless tugging, striking, or inappropriate use of cutting devices. Once the unit has been unpacked, refer to the installation drawings as listed in paragraph 8-2, including the minimum clearances as described in Figure 8-1 to determine optimal placement of the HPBAC.

**8.4.2 PRESERVATION.** If the HPBAC has been removed and needs to be transported, observe the preservation requirements in paragraph 2.3.2.2 prior to packing. If it is expected that the HPBAC will be crated for a period of 30 days or more, refer to the Planned Maintenance System (PMS) Lay-Up Maintenance Requirement Cards (MRC) LU-1 and LU-2 (SYSCOM MIP 5519/025).

**8.4.3 PACKING.** The HPBAC is packed in a wooden crate mounted on a 60" x 60" x 6" pallet reinforced with 1" thick plywood. The crate is fastened to the pallet with 3/4-10 screws, 3/4 washers, and 3/4-10 nuts, with one set of fasteners on each shock isolator plate. The side walls consist of a pair of long panels (60" wide x 66" high x 0.5" thick) and a pair of short panels (60" wide x 60" high x 0.5" thick) made from plywood. The long panels have 2 x 4 and 2 x 2 studs attached to the closed sides of the pallet with nails or screws. The bottom end of each stud rests on the pallet. The bottom edge of each short panel also rests on the pallet. Wood screws are used to attach the short panels to the side edges of the 2 x 4 studs on the long panel. The short panels are designed to cover all but the open sides of the pallet, thus allowing access to the forks of a forklift. The top consists of 60" x 60" x 0.5" plywood, which is attached with screws to the top of edges of the 2 x 4 and 2 x 2 studs.



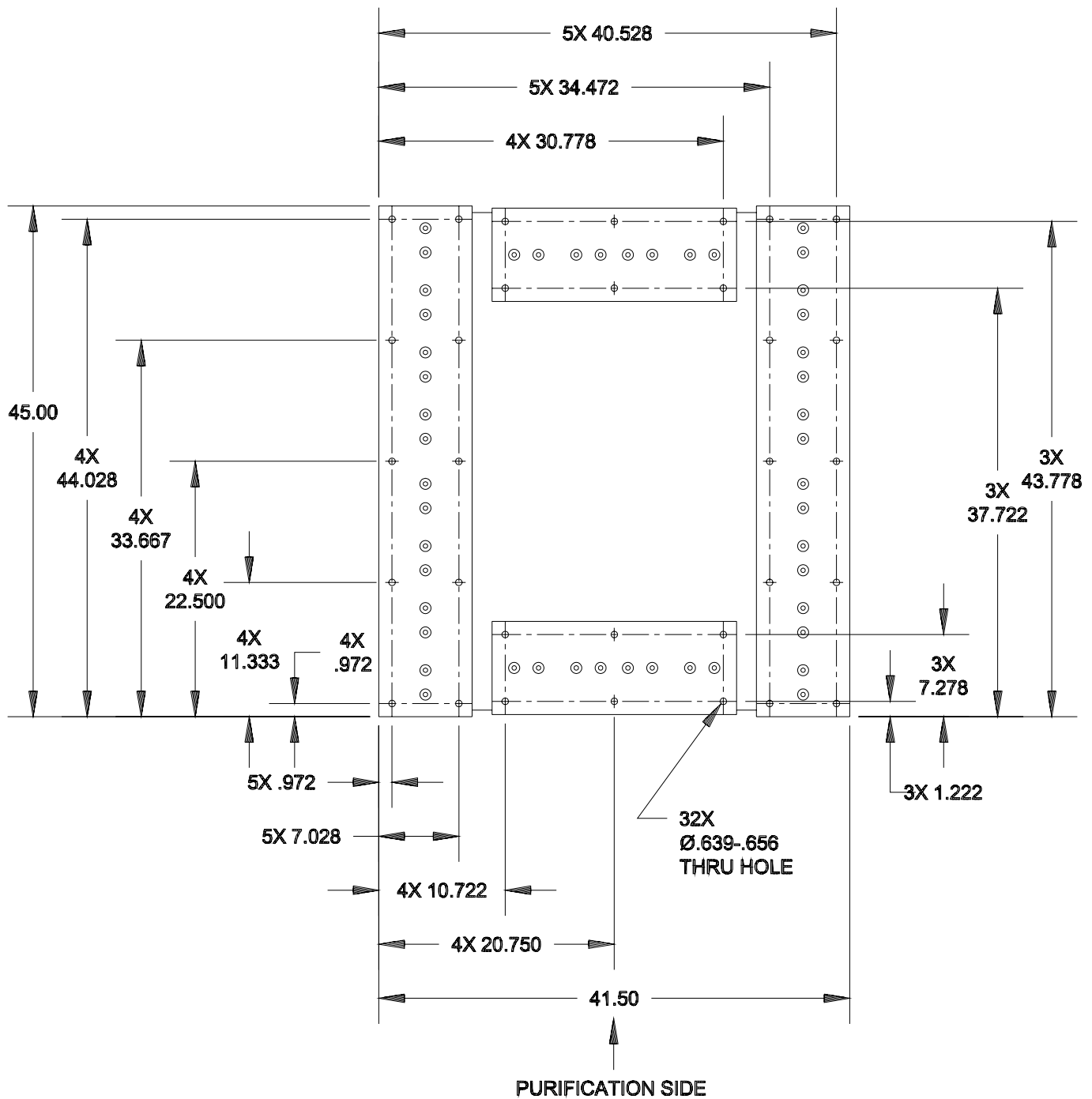


Figure 8-2. Footprint, Cable Mount Base Plate

## 8.5 INPUT REQUIREMENTS.

**WARNING**

**Lock out and tag ship's electrical power source before wiring HPBAC instrument and control panel.**

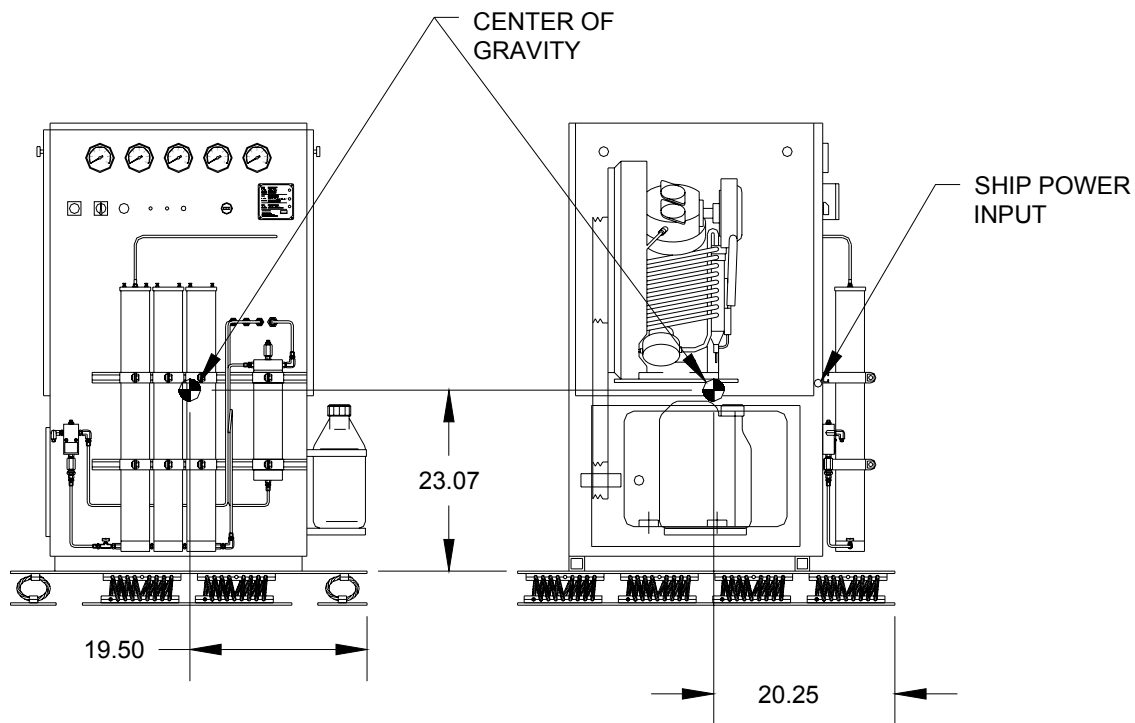
**8.5.1 ELECTRICAL.** Electrical power of 440V, 3 phase, 60 Hz cycle must be available from the ship's electrical system. The HPBAC wire harness will already be in place and the Master ON/OFF selector switch (ISS on the electrical wiring diagram) ready to connect to the ship's electrical supply (see Figure 5-3 and Figure 8-3). Connect the ship's phase A wire to terminal 3 to the Master ON/OFF selector switch on the control panel (switch ISS at upper left of the wiring diagram); connect phase B wire to terminal 1, and connect phase C wire to terminal 5. Remove tag and restore ship's power to HPBAC. Check Master ON/OFF selector switch for any anomalies.

**8.5.2 ECOLOGICAL.** The compressor should be well lit and have adequate ventilation to keep ambient temperature from rising above 140 °F. Low-end temperatures must remain above 32 °F to preclude freezing of condensate lines or reservoir. Additional heat generating equipment or piping should be avoided in the same workplace or must be well-insulated. Fresh air is important for successful operation; avoid locating equipment where exhaust fumes from internal combustion engines, fumes from the galley, odors or vapors from workshops or paint booths, or other sources of atmospheric pollution may contaminate the intake air. Adequate intake and exhaust openings dependent on room volume are given in Table 8-1.

## 8.6 INSTALLATION CHECKOUT.

**8.6.1 PHYSICAL CHECK.** Conduct a physical inspection of the HPBAC to verify that there is no damage and that all the components are in place. For detailed instructions, refer to Post Repair Operational Tests for LPD4 Class Ships (Design Test Procedure, Test Memo No. 04776). Ensure the following checks have been satisfactorily completed before attempting to start the HPBAC:

- Air filter element is in place.
- Dryer/purification filters are installed.
- Bleed valve is closed.
- Condensate drain reservoir is in place.
- Manual drains on Automatic Condensate Drain (ACD) are closed.
- Securus® monitor probe is connected.
- Oil filler cap is in place.
- Oil level is adequate.



**Figure 8-3. Ship's Power Input and Center of Gravity**

**Table 8-1. Intake and Exhaust Opening vs. Room Volume**

Intake and Exhaust Openings Dependent on Room Volume (V) and Height (h)*					
V=1750 ft <sup>3</sup> h=6.5 ft		V=3500 ft <sup>3</sup> h=10ft		V=7000 ft <sup>3</sup> h=13 ft	
Intake (ft <sup>2</sup> )	Exhaust (ft <sup>2</sup> )	Intake (ft <sup>2</sup> )	Exhaust (ft <sup>2</sup> )	Intake (ft <sup>2</sup> )	Exhaust (ft <sup>2</sup> )
20.6	17.2	15.6	12.9	9.7	8.1

\* If natural ventilation is insufficient, circulation can be increased with a fan in the exhaust opening

<b>CAUTION</b>
----------------

**Operation without adequate lubricating oil in the crankcase will seriously damage the compressor.**

**8.6.2 PRE-START CHECK.** Refer to Chapter 2, Operation, before attempting to start. Ensure the operating log (Figure 2-6) and maintenance log have been filled out before operating the HPBAC. Make a thorough record of procedures and results of the installation checkout.

**8.7 QUALIFIED OPERATOR.**

Ensure that the operator is thoroughly trained before operating the HPBAC. High pressure compressors can be lethal to an untrained operator and anyone else near the unit.

**THIS PAGE INTENTIONALLY LEFT BLANK**